From: Schmauder, Craig R SES (US) [redacted]
Sent: Friday, February 21, 2014 4:28 PM
To: Peck, Gregory; Laity, Jim
Cc: Dominguez, Marie Therese SES USARMY (US)
Subject: FW: Latest Draft of WOUS Rule and Preamble (UNCLASSIFIED)
Attachments: Summary of Corps Comments on OMB comments on WOUS proposed Rule.docx

Importance: High

Classification: UNCLASSIFIED
Caveats: NONE

Greg and Jim, I have not yet had an opportunity to review the Corps' comments myself as I just now received them, but thought it would be best if we did a concurrent review.

R-- Craig

Craig R. Schmauder, SES
Deputy General Counsel
Installations, Environment & Civil Works

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-----Original Message-----
From: Gaffney-Smith, Margaret E HQ [redacted]
Sent: Friday, February 21, 2014 3:42 PM
To: Schmauder, Craig R SES (US); Dominguez, Marie Therese SES USARMY (US)
Cc: Hannon, James R HQ02; Moyer, Jennifer A HQ02; Smith, Charles R CIV (US); Stockdale, Earl H HQ02; Gaf fney-Smith, Margaret E HQ
Subject: Latest Draft of WOUS Rule and Preamble (UNCLASSIFIED)
Importance: High

Classification: UNCLASSIFIED
Caveats: NONE

Craig,

Regulatory and Counsel Staff have reviewed the OMB document and suggested edits and we have also reviewed the EPA response to OMB edits. Today we met with Chip and collectively developed the attached table/document of our comments.

In our view there are many excellent suggestions offered by OMB that will provide greater clarity to the proposed rule.

We remain extremely concerned with the manner in which the Ditch Exclusions and the language in the Tributary Section and science to support regulation of tributaries by rule is reflected and we believe more work should be done to address sections where language in this proposed rule is inconsistent and/or contradictory.

Attached is a summary of our detailed comments - and explanations of our position on the edits reviewed.

There are many areas that we believe should have further discussion and these ar e identified in the attached document.

We prepared this review on very short notice but have done our best to produce comments that are useful. Unfortunately, we have not been part of discussions with OMB or with EPA on this topic but it is our hope that the attached document conveys our comments clearly and in a manner that can be shared with OMB and EPA and that ultimately all of our offices can continue to work together to move this action forward.

We are available to discuss with you at your earliest convenience.

Respectfully,
Meg

Meg Gaffney-Smith
Regulatory Branch Chief
Headquarters, U.S. Army Corps of Engineers
441 G Street, NW
Washington, DC 20314-1000
[redacted]

-----Original Message-----
From: Schmauder, Craig R SES (US) [redacted]
Sent: Tuesday, February 18, 2014 12:12 PM
To: Gaffney-Smith, Margaret E HQ; Smith, Charles R "Chip"
Cc: Hannon, James R HQ02; Dominguez, Marie Therese SES USARMY (US)
Subject: [EXTERNAL] Latest Draft of WOUS Rule and Preamble (UNCLASSIFIED)
Importance: High

Classification: UNCLASSIFIED
Caveats: NONE

Meg and Chip, I would be most interested in having a quick review and sign off on the edits that OMB has suggested based on interagency review. The second document is the most current draft provided by EPA which incorporates DOJ and OMB's edits. You will see where request for additional comments has been ad ded in several places.

Need as soon as possible please. We are getting close to publishing.

R-- Craig

Craig R. Schmauder, SES
Deputy General Counsel
Installations, Environment & Civil Works

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Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Definition of "Waters of the United States" Under the Clean Water Act
Draft Rule as of 20Feb14

On February 18, 2014, OGC provided two documents for review (333 pages each), a markup of the draft rule by OMB and a markup of the draft rule by EPA. Neither OASA(CW) staff nor USACE staff have not been given the opportunity to markup the rule and propos e improvements, corrections, or clarifications.

To conduct a rapid review, we flagged every page with edits by OMB, then compared those pages to the markup produced by EPA. Where OMB and EPA markups were identical we used only the OMB draft. Where markups were different we clipped the appropriate pages together for further review and made observation in the "Comments" column below.

The results by page are:

- Concur with OMB edits = 45 pages
- Concur with OMB edits with modification = 2 pages
- Discuss for understanding and agreement = 18 pages
- Discuss as a potential critical issue = 4 pages
- Discuss to receive OMB guidance = 2 pages

Recommend coordinating the results of my rapid review with the Corps, discussing the results to find vertical alignment, then requesting a meeting with OMB and EPA to work though the edits where we note issues or the need for better understanding.

Page(s)	USACE/Army Staff Determination RE OMB Edits	Comments
2	concur with a modification	Change "EPA is considering" to "the agencies are considering"
3	concur	EPA omits "though that would not necessarily be the case for the four alternate options that EPA is considering". Recommend retaining this phrase for clarity, but change reference to EPA to "the agencies".
4	concur	
5	concur	
6	concur	EPA deletes "Does This Action Apply to Me?" Why? This has been in the draft rule for several years and seems like a very good section to have. Recommend it not be deleted.
8	concur	Again, EPA deletes the discussion of "Does This Action Apply to Me?" Recommend this section not be deleted.
10	concur	Concur with EPA insertion of "other" and "adjacent open waters"

Page(s)	USACE/Army Staff Determination RE OMB Edits	Comments
11	concur	
15		Concur with EPA insertion of "relatively permanent"
16	concur	
17	concur	EPA deletes "all". Why" Recommend retaining "all" as it is correct and reflects the goal of achieving clarity and bright lines.
18	concur	
19	concur	Need to scrub draft rule per OMB comment for consistency regarding whether ditches excluded under b4 and b5 are non-jurisdictional tributaries, or not included in the definition of tributaries. Agree that the draft rule now says ditches are non-jurisdictional tribs in some places, and excluded from being tribs in others.
20	concur	
21	concur	
22	concur	EPA adds language on "water transfers" which seems okay.
23	concur	**Strongly concur with OMB suggestion to request comment on the 404f interpretive rule. Having this go into effect immediately will be a major red flag and point of contention and litigation at a time when the agencies are hoping for more support than opposition. Further, the 404f exemption will eliminate regulation of activities that are now being regulated, with compensatory mitigation requirements. Taking public comment is good government and the agencies may receive very helpful input. In addition this public comment period will also afford the agencies time to work together to implement the new broad interpretation of the 404(f) Exemptions. If a public comment period is not offered RECOMMEND that the EPA interpretive rule not go into effect until 60 days after it is published to allow agencies time provide training and develop implementation guidance to ensure effective and consistent implementation of the new rule.**
24	concur	Note, strongly support use of "and" in all places recommended by OMB.
28	concur	Yes, "and" not "or"

Page(s)	USACE/Army Staff Determination RE OMB Edits	Comments
30	concur	Good OMB point about not equating "significant" with more than speculative and insubstantial" and the latter informs the former, and they are not synonymous.
31	discuss	**OMB is concerned about language that could indicated that some adjacent wetlands might not have a significant nexus. He nce, EPA deleted the language. However, we have always supported the notion of having language about strength of connection and distance in some circumstances. Recommend discussing this with OMB and EPA and looking for a way to retain the thought through edits rather than deleting the text. This is a significant concern since the rule language does not provide a bright line and the language regarding distance is no longer in the preamble. Understand OMBs concern but do not think we should have deleted that language. Need to discuss to better understand how this will impact waterbodies outside the floodplain/riparian area under the new definition of adjancency/neighboring and in light of the language on confined conveyances.**
33	concur	
34	concur	Consider deleting the word "strongly" in the phrase "Adjacent waters, as defined in this proposal, are strongly chemically, physically, or biologically connected….."
36	concur	
37-41	concur	
42, 57-59, 118, 122, 123	Discuss-critical1	Language and discussion of "ditches that are excavated wholly in uplands, drain only uplands, and have less than PERENNIAL flow". This language provides the bright line and clarity OMB is looking for, and also sets a marker of what is "non-jurisdictional" without caveats. What are the practical implications of this in terms of waterbodies currently protected that would no longer be protected. We should understand the impacts of this going in and to understand it the agencies may need to review files or do some desk JD work for key areas like Florida, California,

Page(s)	USACE/Army Staff Determination RE OMB Edits	Comments
		Upper Midwest and the Arid West, for example. There are many edits on these 4 pages and we should go through them as a group very thoroughly. This will be a hot-button issue. This could be a significant impact on farm fields especially when those areas are proposed for a change in use.
43	concur	**EPA cut "regularly", believe it is critical to retain this word for clarity and consistency reasons. Also, the concept of "regulatory" is important to avoid creating issues about inundation periods, especially infrequent ones. Needs more discussion.**
44	concur	
46-47, 49	concur	
50	concur	Agree with OMB suggestion to replace "strong" with "significant" regarding impacts on the C, P, B integrity of waters.
51-52	concur	
53	concur	Okay deleted the sentence recommended by OMB. Believe EPA draft does delete it. Question, in the sentence "The agencies' proposed definition of "tributary" includes…….and ditches not excluded…..", before ditches do we need to add "with less than perennial flow"?
54-55	concur	
56	discuss	OMB recommends deleting a paragraph which EPA retains. OMB is looking for a bright line and they feel this paragraph confuses the issue. Need to better understand the language and the rationales for retaining it or deleting it.
61-64	concur	Okay with EPA replacement of "question" with the word "reject" on page 64.
65-69	concur	
66	concur	Strongly support OMB's new text about single tribs and multiple tribs because it adds much clarity and provides easy to follow guidance. Should eliminate confusion in the field.
70	Discuss-critical 2	OMB notes that the current language "totally undercuts the ditch exclusion and appears to say there is no scientific or legal basis for it". Agencies should meet and thoroughly discuss the issue, the policy objective, litigation strategy, public perception issues,

Page(s)	USACE/Army Staff Determination RE OMB Edits	Comments
		impacts on aquatic resources, and then figure out what language to use. The decision to exclude b(4)b(5) ditches needs to be explained in the preamble and contradictory statements and information in the tributary section and science needs to be addressed.
72	concur	
73	discuss	Recommends rule text edit. Understand and discuss.
74	concur	EPA deletes "directly", prefer to retain this for clarity, bright line reasons, plus physical proximity is important to keep in mind or the rule becomes vague and to open to interpretation.
75	Concur	Okay with deleting confusing text.
76-77	**discuss**	**OMB concerned about "huge amount of uncertainty" and undercutting earlier distinctions. OMB recommends taking comment on this. Concerned that critics will focus on the lack of clarity the language will cause. Agree. Should understand and discuss the new text EPA added and see if it responds to OMBs concerns. It seems to. The Corps believes that the concept of proximity in the section on adjacent/neighboring is an important clarification for these determinations. In addition, that proximity be incorporated into the definitions for adjacency/neighboring.**
78	**discuss**	**EPA adds "above", so the revised text would be "Shallow subsurface connections may be found above and below the ordinary root zone" --- as a technical matter, this does not make sense. And is not consistent with our understanding of the root zone definition. What are the implications in the field and for jurisdiction? This is a totally new concept inserted by EPA and is not clear. Need to discuss with EPA.**
79-82	concur	
83	discuss	EPA changed an "and" to "or". Why? Which term is best here? Could have major implications so we should be clear on intent and impacts.
84	concur	
85	concur	EPA rejected OMB's edit to delete "animals" and replace it with "aquatic species". I like "aquatic

Page(s)	USACE/Army Staff Determination RE OMB Edits	Comments
		species" because aquatic resources are the focus of CWA jurisdiction, the OMB edit adds clarity and appropriate focus. "animals" is too broad and open-ended, and will pull in species only marginally associated with the aquatic environment. We also discussed use of aquatic species in earlier discussions this seems to be a retreat by EPA on an earlier agreement between the agencies.
86	concur	
87	discuss	OMB recommends deleting a discussion of floodplain, riparian area, and distance --- EPA prefers to retain the discussion. EPA rejects this approach. Understand and discuss.
88	discuss	See if EPA edits make the text less broad and questionable.
90-91	concur	
92	discuss	Major point to understand and discuss. The concept of "watershed" has been a challenging one to understand and describe. What is best here for a proposal for public comment?
94-96	concur	EPA rejected OMB insertions/edits which to me provide clarity, accuracy, and bright lines that are very helpful for regulators and applicants.
97	discuss	Need to understand the OMB comment and concern and then figure out how best to address it. We have worked hard to describe mapping tools, SPOE, scale of analysis, and how to approach the question of defining watershed size, etc.
98	concur	
99	discuss	EPA rejected OMB deletion of "downstream". Would like to understand why OMB deleted the word and why EPA would like to retain it.
100	concur	
101	discuss	Need to better understand OMB edit and how to address it --- site specific analysis issue.
102	discuss	Okay with EPA edits "will likely result in" and "that significantly affect other covered waters". Are USACE and OMB okay with these edits?
104	concur	Okay with EPA edits; no OMB edits
105	discuss	EPA has removed language requesting comment on ways to best map and identify boundaries. Need to understand why as the deleted text seems like text we would want to retain.

Page(s)	USACE/Army Staff Determination RE OMB Edits	Comments
106	verify	EPA edits seem okay, discuss with USACE.
107	discuss	EPA deletes" through rulemaking"? Why? Seems like this language should be retained.
108-113	discuss	EPA edits seem okay
114	discuss	Why did EPA delete the phrase about "lack of a strong connections"?
115	discuss	Concur with OMB edit. Discuss the meaning and need for the EPA edit questioning an approach when it is simply being teed up for comment. Seems to be a prejudicial statement and unnecessary.
116	concur	EPA does not accept OMB edit on need for "conformity". Recommend we accept it.
117	concur	
121	concur	With EPA minor edit
121-123	Discuss-critical3	Numerous differing OMB and EPA edits to understand and discuss related to ditches, perennial versus other flows, characterizations of what the public understands and what the public doesn't understand, extensive new text by EPA which may be okay RE ditches (p. 122).
123-124	Discuss-critical4	EPA's Economic Analysis is characterized as addressing the costs and benefits of the proposed rule. This analysis was done in 2010 based mostly on 2009-2010 data, and for a version of the draft Guidance that ultimately was tabled. The analysis has not be revised to specifically evaluate the benefits and cost of the proposed rule, which is very different from the proposed Guidance. Is this a significant, potential weakness that opponents can use to derail this effort?
127-128	Request guidance from OMB	The agencies have not done proper consultation with federally-recognized tribes or properly evaluated impacts to reservation lands, or treaty and trust resources. Some phone coordination occurred several years ago for a version of the draft guidance. No coordination or consultation has occurred for the proposed rule, and there has been no analysis of impacts, beneficial or adverse. If the intent is to proceed without consultation at this time we may want to add a robust

Page(s)	USACE/Army Staff Determination RE OMB Edits	Comments
		discussion about how this will be done during the comment period and before the rule is finalized.
130	Request guidance from OMB	The draft Environmental Assessment needs to be revised. The proposed rule has changed significantly and is still changing. Request OMB's advice on whether the EA needs to be revised and released with the draft rule for public comment, or if the intent is not to release it and simply have a final EA done for the final rule? If the former course of action is recommended, Army will need time to review and revise its draft EA.

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March 14, 2012

ENVIRONMENT AND NATURAL RESOURCES DIVISION COMMENTS ON THE FEBRUARY 17, 2012 DRAFT *GUIDANCE ON IDENTIFYING WATERS PROTECTED BY THE CLEAN WATER ACT*

Thanks for the opportunity to review the February 17, 2012 draft final package comprising the joint Environmental Protection Agency (EPA) /U.S. Army Corps of Engineers (Corps) final *Guidance on Identifying Waters Protected by the Clean Water Act* [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Attachments

From: Laity, Jim
Sent: Monday, November 04, 2013 5:48 PM
To: Patel, Manisha
Cc: Higgins, Cortney
Subject: RE: Reg Flex Act and WOTUS

Thx Manisha. [redacted]

[redacted]

I plan to set up a meeting for SBA and the agencies to discuss shortly. I will make sure to invite you an d welcome your further insights. Jim

From: Patel, Manisha
Sent: Monday, November 04, 2013 5:16 PM
To: Laity, Jim
Subject: RE: Reg Flex Act and WOTUS

Hi Jim,

[redacted]

I've got to run tonight, but happy to discuss further tomorrow (by phone may be easier?), if you'd like.

Thanks,
Manisha

From: Laity, Jim
Sent: Monday, November 04, 2013 4:30 PM
To: Patel, Manisha
Subject: RE: Reg Flex Act and WOTUS

Thanks Manisha. [redacted]

From: Patel, Manisha
Sent: Monday, November 04, 2013 1:33 PM
To: Laity, Jim; Guzy, Gary S.; McConville, Drew; Jensen, Jay; Kumar, Chitra; Huang, Jennifer (Intern); Foy, Phillip (Intern); Snow, Sydney (Intern); Finken, Anne
Subject: Reg Flex Act and WOTUS

PRIVILEGED & CONFIDENTIAL -- ATTORNEY CLIENT COMMUNICATION

Hi Jim and CEQ Reg Review Team,

[redacted]

Please do keep me in the loop if this issue comes up. If this is an issue again, I am happy to help address and resolve any legal questions that come up.

Best,
Manisha

Manisha D. Patel
Deputy General Counsel
Council on Environmental Quality
[redacted]

Waters of the US Outstanding Policy Issues

Background

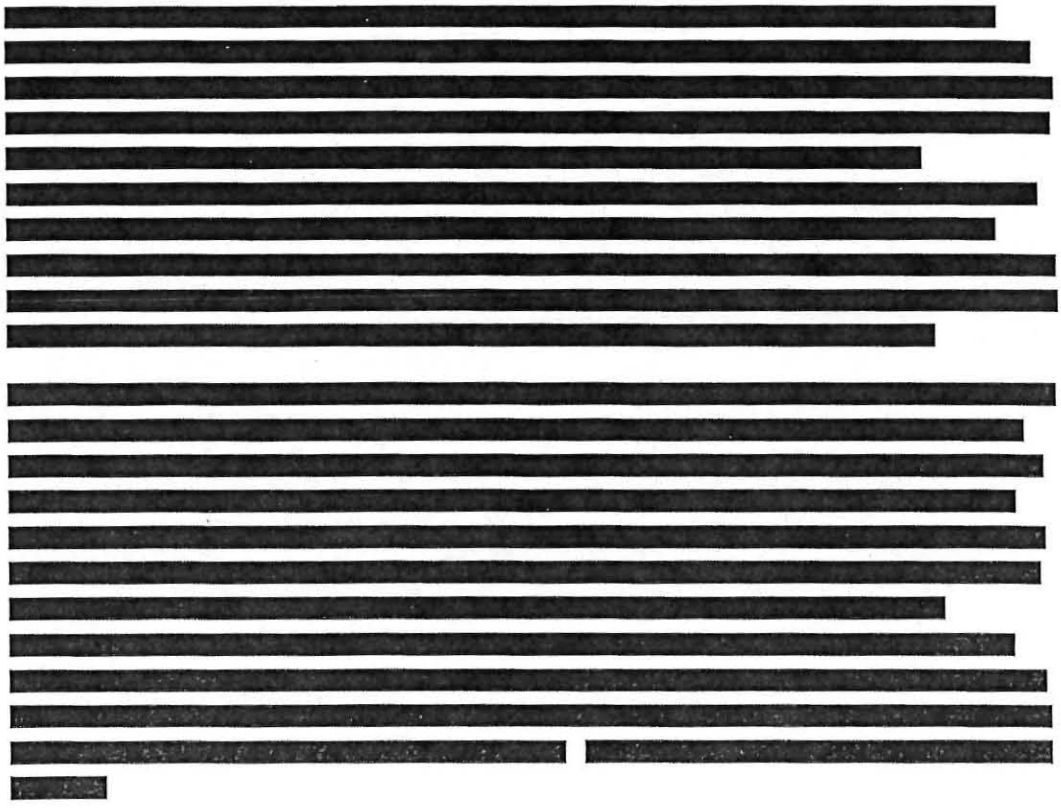
The Clean Water Act includes various programs to protect "navigable water," defined in the Act as "the waters of the United States." The latter term is not defined in the statute. Any water not deemed to be a "water of the US" is excluded from the protections of the CWA, and is instead left to states and local communities to manage and protect as they see fit. Since the Act was passed in 1972, there was a gradual expansion through a series of rulemakings, guidance documents, and court decisions in the EPA's understanding of the scope of waters covered by the Act. This issue also affects the Army Corps of Engineers, which administers one portion of the CWA (the Section 404 program) that regulates the "discharge of dredge or fill materials" and is the primary vehicle for protecting wetlands from being filled in. By 2001, the agencies generally interpreted the term "waters of t he US" as covering virtually all water bodies and wetlands.

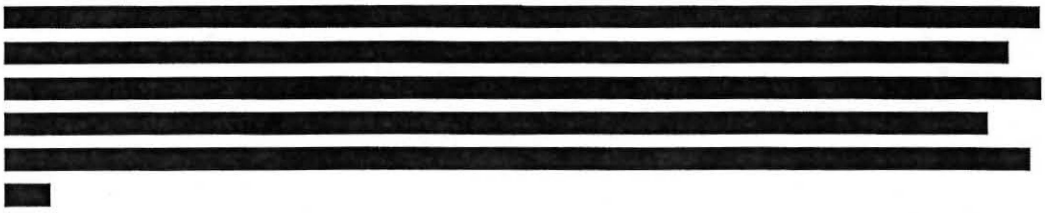
In 2001 and 2006, the Supreme Court issued two landmark decisions (SWANCC and Rapanos) that together suggested that the agencies' current jurisdictional regulations were broader than Congress intended. At the same time, the Court itself was split and did not actually strike down any portion of the existing regulations, which remain on the books. In the first case, the Court questioned jurisdiction over "isolated, non-navigable, intrastate" waters, while in the second a divided Court offered two overlapping but distinct jurisdictional tests: Justice Kennedy suggested that a water is jurisdictional if it has a "significant nexus" to a traditional navigable water, while Justice Scalia suggested inst ead that it is jurisdictional if it is "relatively permanent." Neither justice offered much guidance as to what these vague terms mean in practice. Since then the agencies have struggled to interpret the court decisions in a consistent and reasonable way, and have issued several draft and final guidance documents explaining their current thinking. However there remains widespread confusion over the limits of jurisdiction, and widespread disagreement over what Congress and the courts intended.

In April 2011 the agencies released draft guidance that would replace earlier 2008 guidance and adopt a broader interpretation of the scope of jurisdiction. The 2011 draft guidance would include all tributaries and adjacent wetlands as unambiguously jurisdictional, and offered a path to include some isolated waters as well, on a case-by-case basis. It was strongly supported by environmental and sportsm en groups and strongly opposed by industry, agriculture and developers. State and local governments were split. The only thing that all stakeholders agreed on was that guidance alone would not solve the problem and that rulemaking was needed, as the Court has also said. In February 2012, the agencies submitted draft final guidance for review that largely mirrored the 2011 draft guidance. This guidance was withdrawn from review concurrently with submission of the draft NPRM, on September 17, 2013.

Proposed Rule

The proposed rule would clearly establish jurisdiction over all tributaries of navigable and interstate waters, including ephemeral streams (only flow when it rains) at the upper limits of the tributary system. It would also include as jurisdictional all wetlands and other waters that are "adjacent" to navigable and interstate waters and their tributaries , and provide an improved, science-based definition of adjacency. These waters would be "categorically" jurisdictional that is, no case-by-case determination would be needed. This is a huge improvement over earlier guidance documents. Both the 2008 final guidance and the 2011 draft guidance required a resource intensive and vaguely defined case-by-base determination of "significant nexus" and/or "relatively permanent" for all non -navigable tributaries and their adjacent wetlands. The only substantive differ ence is that the 2008 guidance required that waters be evaluated one at a time, while the 2011 draft guidance allowed waters in a watershed to be grouped for the purpose of determining if their connection to navigable waters was "significant." This had th e effect of making it more likely to find a "significant nexus" for remote streams and wetlands, but did not remove the need for a case -by-case determination and the resulting regulatory uncertainty. The greater certainty in the proposed rule is generally regarded by other Federal agencies as a positive step forward. However, a number of important issues remain unresolved, as discussed below.





From: Laity, Jim
Sent: Sunday, March 16, 2014 4:33 PM
To: Greenawalt, Andrei; Mancini, Dominic J.
Cc: Higgins, Cortney
Subject: WOTUS, bad news

[redacted]This is very discouraging bc I was comfortable with the last version and I was told by EPA staff that they and their management were as well. Even if I were not going to be on vacation next week, I don't see how we could have this ready next week or even the week after, given how far apart we now are.

[redacted]

I see two options at this point. Option 1 is to tell EPA that if they want this concluded quickly they can return to the previous draft, make as many of the largely conforming changes suggested in my Feb 26 pas s back as possible, and provide a final draft by Monday, March 24, in which case we could likely be ready to conclude by the middle of next week.

I have reached the character limit of my iPhone browser. Second email coming...

Sent with Good (www.good.com)

-----Original Message-----
From: Greenawalt, Andrei
Sent: Friday, March 14, 2014 07:02 PM Eastern Standard Time
To: Laity, Jim; Mancini, Dominic J.
Cc: Higgins, Cortney
Subject: RE: Comments on Stromwater TMDL Guidance

Unfortunately, I think folks are going to want to release it quite soon. When do you get back? Let's definitely prioritize this Monday and its fine if that means other things (like TDML) slip, and let's figure out a plan with Dom to finish it up while you are gone if necessary.

From: Laity, Jim
Sent: Friday, March 14, 2014 6:54 PM
To: Greenawalt, Andrei; Mancini, Dominic J.
Cc: Higgins, Cortney
Subject: RE: Comments on Stromwater TMDL Guidance

Yes, let's talk through on Monday.

On another front, I just got the revised preamble of the WOTUS rule from EPA. It has many more changes from the prior version than I was expecting. I don't have any reason to believe that there's anything fundamentally problematic here, but there's a lot for me to go over and it is unlikely that we will have a clean version ready to conclude on by 5 PM Monday, when I have to leave to catch a plane. I think we could have it ready by the end of the following week (March 28). Is this a problem from our per spective?

From: Greenawalt, Andrei
Sent: Friday, March 14, 2014 6:50 PM
To: Laity, Jim; Mancini, Dominic J.
Cc: Higgins, Cortney
Subject: RE: Comments on Stromwater TMDL Guidance

Great thanks no need to do anything on this until Monday, but I'm realizing I may not fully understand the basics of how stormwater permitting even works. No need to write anything up we can just talk it through on Monday over the phone or after Cortney gets back.

From: Laity, Jim

Sent: Friday, March 14, 2014 6:41 PM
To: Greenawalt, Andrei; Mancini, Dominic J.
Cc: Higgins, Cortney
Subject: FW: Comments on Stromwater TMDL Guidance

Andrei: Attached is my last substantive communication with EPA staff on this action. The guidance is fairly short, you can see in the attached the revisions that we feel would make this memo acceptable. They would undo the most objectionable provision of the 2010 guidance while leaving the other clarifications in place. I'm available at your convenience to discuss further.

I was also reminded in reviewing the history of this that several other agencies (DOD and DOT) had similar concerns to ours (comments attached).

--Jim

From: Laity, Jim
Sent: Friday, April 27, 2012 7:35 PM
To: Deborah Nagle ([redacted])
Cc: Mancini, Dominic J.
Subject: Comments on Stromwater TMDL Guidance

Deborah, Attached are my comments. I have been as ked to tell you that if EPA prefers to simply withdraw the November 2010 guidance, indicate that the 2002 guidance remains in effect, and state that the issues raised in the 2010 guidance will be addressed in the stormwater rule making, we are fine with th at approach. However, if you wish to go out with revised guidance in the interim, the attached offers suggestions that we would consider appropriate.

I will be out of the office on Monday, but will be available to discuss on Tuesday or later next wee k at your convenience.

--- Jim[redacted]

From: Laity, Jim
Sent: Sunday, March 16, 2014 10:16 PM
To: Greenawalt, Andrei; Mancini, Dominic J.; Higgins, Cortney
Subject: WOTUS further update

I have skimmed the rest of the preamble. There is a lot of rewritten text and I would like to review more closely. I noticed a few areas where I would like to tweak the rewrites, and a few of my earlier comments remain unaddressed, however these are second tier issues that I'm sure can be worked out at the staff level. I did not see any show stoppers other than the changes to the other waters section, except possibly one.

[redacted]

[redacted] Jim

Sent with Good (www.good.com)

-----Original Message-----
From: Greenawalt, Andrei
Sent: Sunday, March 16, 2014 08:11 PM Eastern Standard Time
To: Laity, Jim; Mancini, Dominic J.; Higgins, Cortney
Subject: RE: (No Subject)

This is disappointing. For what it's worth, what folks like Arvin were relaying to me over the last couple weeks (and even as recently as Friday night) was the same message you were hearing. [redacted] In other works, if we told them to go back to the previous draft of the other waters section, would that resolve it?

-----Original Message-----
From: Laity, Jim
Sent: Sunday, March 16, 2014 5:42 PM
To: Mancini, Dominic J.; Greenawalt, Andrei; Higgins, Cortney
Subject: FW: (No Subject)

What they sent me was a clean version. I did a compare against my last passback to facilit ate my review. So the attached shows redline against my lat version, not their last version [redacted]

[redacted] Jim

Sent with Good (www.good.com)

-----Original Message-----
From: Laity, Jim
Sent: Friday, March 14, 2014 06:47 PM Eastern Standard Time
To: James Laity [redacted])
Subject:

From: Mancini, Dominic J.
Sent: Monday, March 17, 2014 12:09 AM
To: Laity, Jim; Greenawalt, Andrei; Higgins, Cortney
Subject: RE: (No Subject)

Thanks Jim, my pages are not the same as yours but I think I was able to find the section. [redacted]

[redacted]

[redacted]

-----Original Message-----
From: Laity, Jim
Sent: Sunday, March 16, 2014 5:42 PM
To: Mancini, Dominic J.; Greenawalt, Andrei; Higgins, Cortney
Subject: FW: (No Subject)

What they sent me was a clean version. I did a compare against my last passback to facilitate my review. So the attached shows redline against my lat version, not the ir last version [redacted] Jim

Sent with Good (www.good.com)

-----Original Message-----
From: Laity, Jim
Sent: Friday, March 14, 2014 06:47 PM Eastern Standard Time

To: James Laity [redacted]
Subject:

From: Laity, Jim
Sent: Monday, March 17, 2014 1:08 AM
To: Mancini, Dominic J.; Greenawalt, Andrei; Higgins, Cortney
Subject: RE: (No Subject)

[redacted]

Well enough of my venting. As u can tell I am very frustrated. I really thought we had a work able way forward. I will await your guidance on next steps. Jim

Sent with Good (www.good.com)

-----Original Message-----
From: Mancini, Dominic J.
Sent: Monday, March 17, 2014 12:09 AM Eastern Standard Time
To: Laity, Jim; Greenawalt, Andrei; Higgins , Cortney
Subject: RE: (No Subject)

Thanks Jim, my pages are not the same as yours but I think I was able to find the section. [redacted]

[redacted]

-----Original Message-----
From: Laity, Jim
Sent: Sunday, March 16, 2014 5:42 PM
To: Mancini, Dominic J.; Greenawalt, Andrei; Higgins, Cortney
Subject: FW: (No Subject)

What they sent me was a clean version. I did a compare against my last passback to facilitate my review. So the attached shows redline against my lat version, not their last version [redacted] Jim

Sent with Good (www.good.com)

-----Original Message-----
From: Laity, Jim
Sent: Friday, March 14, 2014 06:47 PM Eastern Standard Time
To: James Laity [redacted])
Subject:

From: Shelanski, Howard
Sent: Monday, March 17, 2014 11:52 AM
To: Mancini, Dominic J.
Cc: Greenawalt, Andrei; Laity, Jim
Subject: Re: WOTUS

[redacted]

----- Original Message -----
From: Mancini, Dominic J.
Sent: Monday, March 17, 2014 11:35 AM Eastern Standard Time
To: Shelanski, Howard
Cc: Greenawalt, Andrei; Laity, Jim
Subject: WOTUS

Hi Howard,

Per our discussion, attached is the compare doc. The page numbers don't appear to be exactly the same when everyone opens this on their computer, probably due to redline resolution [redacted] Here are the issues so far, as we see them, sorry a bit long. I would add that there are frequent edits throughout the document and there could be other things as well:

[redacted]

-Notwithstanding substance, this rewrite definitely needs to be sent to the interagency group, and we think they would need at least a week.

From: Peck, Gregory <[redacted]>
Sent: Wednesday, October 01, 2014 3:12 PM
To: Laity, Jim
Cc: Schmauder, Craig R SES (US)
Subject: Advocacy Comment Letter on Waters of the US Proposed Rule
Attachments: Final WOTUS Comment Letter.pdf

Jim:

Wanted you to see this letter from SBA Office of Advocacy. [redacted] Can this be addressed?

Best regards,
Greg

Gregory E. Peck
Chief of Staff
Office of Water
1200 Pennsylvania Avenue
Washington, D.C. 20460

[redacted]

Waters of the US Outstanding Policy Issues

Updated 1/9/14 (updates in redline)

Background

The Clean Water Act includes various programs to protect "navigable water," defined in the Act as "the waters of the United States." The latter term is not defined in the statute. Any water not deemed to be a "water of the US" is excluded from the protections of the CWA, and is instead left to states and local communities to manage and protect as they see fit. Since the Act was passed in 1972, there was a gradual expansion through a series of rulemakings, guidance documents, and court decisions in the EPA's understanding of the scope of waters covered by the Act. This issue also affects the Army Corps of Engineers, which administers one portion of the CWA (the Section 404 program) that regulates the "discharge of dredge or fill materials" and is the primary vehicle for protecting wetlands from being filled in. By 2001, the agencies generally interpreted the term "waters of the US" as covering virtually all water bodies and wetlands.

In 2001 and 2006, the Supreme Court issued two landmark decisions (*SWANCC* and *Rapanos*) that together suggested that the agencies' current jurisdictional regulations w ere broader than Congress intended. At the same time, the Court itself was split and did not actually strike down any portion of the existing regulations, which remain on the books. In the first case, the Court questioned jurisdiction over "isolated, non-navigable, intrastate" waters, while in the second a divided Court offered two overlapping but distinct jurisdictional tests: Justice Kennedy suggested that a water is jurisdictional if it has a "significant nexus" to a traditional navigable water, while Justice Scalia suggested instead that it is jurisdictional if it is "relatively permanent." Neither justice offered much guidance as to what these vague terms mean in practice. Since then the agencies have struggled to interpret the court decisions in a consistent and reasonable way, and have issued several draft and final guidance documents explaining their current thinking. However there remains widespread confusion over the limits of jurisdiction, and widespread disagreement over what Congress and th e courts intended.

In April 2011 the agencies released draft guidance that would replace earlier 2008 guidance and adopt a broader interpretation of the scope of jurisdiction. The 2011 draft guidance would include all tributaries and adjacent wetlands as unambiguously jurisdictional, and offered a path to include some isolated waters as well, on a case-by-case basis. It was strongly supported by environmental and sportsm en groups and strongly opposed by industry, agriculture and developers. State and local governments were split. The only thing that all stakeholders agreed on was that guidance alone would not solve the problem and that rulemaking was needed, as the Court has also said. In February 2012, the agencies submitted draft final guidance for re view that largely mirrored the 2011 draft guidance. This guidance was withdrawn from review concurrently with submission of the draft NPRM, on September 17, 2013.

Proposed Rule

The proposed rule, as submitted to OIRA, would clearly establish jurisdictio n over all tributaries of navigable and interstate waters, including ephemeral streams (only flow when it rains) at the upper limits of the tributary system. It would also include as jurisdictional all wetlands and other waters that are "adjacent" to navigable and interstate waters and their tributaries , and provide an improved, science-based definition of adjacency. These waters would be "categorically" jurisdictional that is, no case-by-case determination would be needed. This is a huge improvement over earlier guidance documents. Both the 2008 final guidance and the 2011 draft guidance required a resource intensive and vaguely defined case-by-base determination of "significant nexus" and/or "relati vely permanent" for all non-navigable tributaries and their adjacent wetlands. The only substantive difference is that the 2008 guidance required that waters be evaluated one at a time, while the 2011 draft guidance allowed waters in a watershed to be grouped for the purpose of determining if their connection to navigable waters was "significant." This had the effect of making it more likely to find a "significant nexus" for remote streams and wetlands, but did not remove the need for a case -by-case determination and the resulting regulatory uncertainty. The greater certainty in the proposed rule is generally regarded by other Federal agencies as a positive step forward.

[redacted]

From: Dorjets, Vlad
Sent: Wednesday, May 13, 2015 6:51 PM
To: Kohl, Elizabeth; Dan Cohen (DOE); [redacted] Shoshana Lew, DOT 'Kumor, Kenneth M. (HQ LD020)'; 'Park, Morgan E CIV OSD ODCMO (US)'; Eric Gormsen (DOJ); Kia Dennis (SBA); Poe, Michael OBPA; 'Portis, Benjamin C'; Asha Mathews (DOC); Johansson, Robert OCE; [redacted] Angar, Megan
Cc: [redacted] Elizabeth Klein, DOI [redacted] Kathryn Thomson, DOT K. Welsh, DOC Claudia Rodgers, SBA [redacted] Daniel Christenson, USDA J.C. Maierhofer, TVA Patrica I. Toppings, DOD [redacted] Johnson, Katie B.
Subject: Clean Water Rule Revised Rule/Preamble and Economic Analysis
Attachments: WOUS OMB Comments Final MAY 13 2015 internal edits.docx; Economoc Analysis MAY 13 2015 comparison document.docx

Importance: High

Colleagues,

Attached please find the promulgating agencies' passback to comments on the Clean Water Rule. Please note that internal conversations are continuing to take place on a couple of issues but we didn't want those issues to hold up review.

[redacted]

[redacted] Pleas e also note that OMB has committed to concluding its review by next Wednesday, May 20th. This leaves very little time to review these documents and resolve open issues. To leave as much time as possible for such issues, I will need your agency's responses to these documents **by end of day tomorrow**. In addition, when providing me your agency's responses, please highlight in the cover email and issues you deem to be "major" and possibly warranting discussion with EPA and the Corps and possible elevation. Pleas e also make be prepared to make necessary arrangements to discuss those issues with EPA and the Corps the following week, if necessary.

I realize that this is a heavy lift and apologize for the inconvenience but the timing of this rule was a high level de cision beyond OMB's control.

Regards,

Vlad

Vlad Dorjets
Natural Resources and Environment Branch
Office of Information and Regulatory Affairs
White House Office of Management and Budget
[redacted]

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
441 G STREET, NW
WASHINGTON, DC 20314-1000

REPLY TO
ATTENTION OF

CECW-CO-R

15 May 15

MEMORANDUM FOR Deputy Commanding General for Civil and Emergency Operations, U.S. Army Corps of Engineers (ATTN: MG John W. Peabody)

THROUGH the Chief of Operations and Regulatory, U.S. Army Corps of Engineers (ATTN: Edward E. Belk)

SUBJECT: Economic Analysis and Technical Support Document Concerning the Draft Final Rule on Definition of "Waters of the United States"

1. References

a. *Draft Final Economic Analysis of the EPA-Army Clean Water Rule*, U.S. Environmental Protection Agency & U.S. Army Corps of Engineers, 27 April 2015

b. *Technical Support Document for the Clean Water Rule: Definition of Waters of the United States*, U.S. Environmental Protection Agency, June 20[illegible]

2. This memorandum responds to your request for a technical analysis of the documents in references a and b. Both documents were prepared by the U.S. Environmental Protection Agency (EPA). With respect to EPA's Economic Analysis, the Corps provided the EPA with raw data on the overall numbers of jurisdictional determinations (JDs) made by the Corps for aquatic resources within the span of control of the Corps' regulatory program, but the Corps had no role in selecting or analyzing the data that EPA elected to use in drafting the attached Economic Analysis document. Similarly, with respect to the Technical Support Document (TSD), Corps data was also used by EPA when crafting the TSD, but the Corps also had no role in actually performing the technical analysis or drafting the TSD.

3. The following paragraphs summarize the Corps Regulatory Program concerns and provide as many examples as possible of what are fundamentally flawed products from a technical aspect. In essence, certain sections of both the Economic Analysis document and the TSD are devoid of any information about how the EPA obtained the results it has presented, rendering the methodology and subsequent results in the documents unverifiable by the Corps.

EPA's Economic Analysis

4. The document includes the EPA's review of Corps JDs from FY 2013 and FY 2014, which the Corps provided to the EPA for the purpose of identifying estimated changes in jurisdiction that would occur as a result of adoption of the draft final rule. However, the attached document fails to identify the actual draft final rule language that EPA applied in performing its review or the methodology used by EPA in applying such language to the Corps' JDs pertaining to isolated

water bodies from FY 2013 and FY 2014. Without an explanation of the methodology or which language was used in this exercise, the Corps cannot verify or provide cogent comments on the results presented by EPA.

5. The document mixes terminology and disparate datasets. For example, stream mitigation costs provided by the Corps appear to have been extrapolated and applied in States where no in-lieu fee program or mitigation bank data exist; there is no explanation of how such data were used or applied to obtain the results presented. Also, the Section 404 data provided by the Corps has been used out of context as if it were applicable to all Clean Water Act (CWA) programs, despite the fact that this data is only meaningful for a specific authority under the CWA (Section 404) and does not represent data under Sections 303, 401, 402, or other programs implemented by EPA and the States for different purposes under the CWA. Compliance costs under Section 404 are presented as representing seventy percent of the draft final rule's total costs and Section 404 benefits representing eighty-seven percent of the draft final rule's total benefits. When presented in this manner, Section 404 costs and benefits appear to far outweigh all other CWA programs combined, which greatly diminish the magnitude of the other, very important CWA programs. Using Section 404 data in this manner and in the absence of data from other programs cannot yield an accurate estimate of the true costs and benefits of those other CWA programs.

6. The document equates aquatic resources with JDs, which are two entirely different data sets. A single JD can provide the determination of jurisdictional status of multiple aquatic resources on a particular site. The revised analysis estimates an increase in the number of section 404 permits, the average impact acreage and corresponding total impact acreage, and an increase in total permit application costs. However, these changes are driven by using the highest number of individual permits and general permits issued in any one year over the five year period from FY 2009-2014 and average impact acreage for permits issued in FY 2013. It is unclear and not explained in the document why impact data from a single year was used to calculate average impact acreage for permits when a five year period was used to estimate the number of permits.

7. The document also makes certain assumptions that have no analytical basis. For example, to account for aquatic resources that are not captured in the Corps' data (e.g., isolated waters on properties of landowners who do not seek a JD from the Corps), EPA used the data from the Corps and simply doubled the number of isolated waters. Doubling data sets in the absence of analysis or basis for doing so cannot withstand even the most cursory technical review. All assumptions should have a justifiable basis, with reasoned logical analysis to support them.

8. The Economic Analysis grossly overestimates the amount of compensatory mitigation required under section 404 the CWA.

a. EPA assumed that all individual permits (IPs) and half of all general permits (GPs) require compensatory mitigation. The actual values are thirty-one percent and 8 percent, respectively, based on data in the Corps ORM2 database.

b. Mitigation totals used by the EPA represented only permittee-responsible mitigation (i.e. mitigation constructed by the permittee), but the totals are characterized as

representing all types of compensatory mitigation, including mitigation banks and in-lieu fee programs.

c. Mitigation totals used by the EPA also included a range of ratios from all compensatory mitigation sources (establishment, rehabilitation, enhancement, preservation), but EPA assumed a 2:1 ratio for all compensatory mitigation.

d. The mitigation cost data tables used are out of date. No quality checks from the Corps on the data that EPA used were requested or obtained. EPA appears to have placed its own data into tables originally provided by the Corps. This results in a gross misrepresentation of the Corps' raw data.

9. The EPA's use of compensatory mitigation as a benefit is also problematic. Estimated Section 404 benefits described in the document based on compensatory mitigation required for permitted impacts, while costs are based on compliance with a Section 404 permit. Both are based on the same unit impact acreage. As compensatory mitigation is typically greater than compliance (i.e. acres of required mitigation are greater than acres of authorized impact), the overall ratio of costs to benefits cannot change. Compensatory mitigation is provided to offset acreage and functions of aquatic resources lost through authorized impacts from Corps permitting with a programmatic goal of achieving no net loss; thus, it is unclear how this translates to a "benefit." Both should be costs.

10. The document is misleading in its geographic representation of data. Based on the sample set of JDs used for its analysis, in many instances EPA used one JD per state to draw conclusions regarding regional variations of the impacts of the draft final rule, such as the draft final rule section (a)(7) categories of isolated waters (prairie potholes, western vernal pools, Carolina bays and Delmarva bays, Texas coastal prairie wetlands, and pocosins). More specificity is necessary to inform the public on the true expected delta of changes in jurisdiction, either lost or gained, jurisdiction under the draft final rule.

11. Although administrative costs were included in the economic analysis accompany the proposed rule, there was no comparable cost requested or provided in the attached Economic Analysis document to accompany the draft final rule. The document estimates CWA jurisdiction to increase from its estimate of 2.7 percent in the proposed rule to 4.65 percent in this analysis of the draft final rule. Section 404 administrative costs are qualitatively described in this document; however, the cost estimate value is left blank. The Corps was not asked to provide information about the increase in administrative costs that would be expected to result from EPA's calculation of increased jurisdiction. Although the Corps is unable to validate how EPA arrived at its estimate of a 4.65 percent increase in jurisdiction, our preliminary review using EPA's estimate indicates that the Corps' administrative costs may increase by $4 million.

12. Several important aspects of jurisdiction were not considered as part of the analysis in the document, which contribute to its technical weakness. The analysis focused only on estimated increases in jurisdiction, not on potential decreases, thus it was limited in its scope. Some of

these aspects were disclosed as assumptions; however, the absence of robust analysis when that analysis is possible is not technically sound.

a. Significant nexus determinations on all types of aquatic resources (e.g. adjacent wetlands) were not reviewed to inform the estimated change in jurisdiction. Only approved jurisdictional determinations on isolated waters were reviewed.

b. A more extensive review of significant nexus determinations would have allowed for an accurate estimation of predicted changes in jurisdiction regarding adjacent waters and tributaries. The assumption was made that all tributaries would be jurisdictional under the final rule; however, some tributaries that are currently jurisdictional might no longer be jurisdictional under the draft final rule.

c. An assumption was made that all adjacent wetlands would be jurisdictional under the final rule; however, some currently jurisdictional adjacent wetlands may not be considered adjacent under the final rule as a result of the "bright-line" distance thresholds and the prohibition on using shallow subsurface and confined surface flow connections to establish adjacency. More analysis is necessary to quantify potential decreases in jurisdiction of these waters, which may offset the potential increase in jurisdiction predicted in the Economic Analysis.

13. Finally, the statement in the Economic Analysis document that "[t]his action does not have tribal implications as specified in E.O. 13175" is patently inaccurate. Both the expansion of and loss of current jurisdiction over WOUS may have significant effects on tribes and treaty/trust resources. These effects have not been identified and evaluated, and the tribes concerned apparently were not consulted as part of the Economic Analysis.

14. In sum, as stated above, the Corps cannot be identified as an author, co-author or substantive contributor to the EPA's Economic Analysis of the draft final rule defining WOUS. I request that all references to the Corps be removed from the attached document and reference made to the EPA only as the author of the product in all documents associated with the final rule.

EPA's TSD

15. As mentioned above, it appears the EPA used a considerable amount of Corps data in preparing the TSD; no data was requested by or provided to EPA to produce the TSD. The Corps also had no role in performing the analysis or drafting the TSD.

16. In the TSD, the EPA overestimates the number of case-specific significant nexus determinations (SNDs) the agencies have completed since 2008. The TSD states that the agencies have made more than 500,000 JDs since 2008, and of those approximately fifty percent included SNDs. This conflicts with Corps data and estimates and the Corps is unclear how and from what dataset EPA derived the estimate included in the TSD.

a. Corps data show that the Corps completed approximately 424,000 JDs on 710,000 aquatic resources.

b. The Corps estimates that, at the uppermost limit, it has completed SNDs on approximately seventeen percent of the aquatic resources for which JDs have been completed.

c. The seventeen percent includes both preliminary and approved JDs.

d. An even smaller percentage of the seventeen percent were required to be coordinated with EPA (e.g., non-relatively permanent waters, wetlands adjacent but not abutting those waters, etc.)

17. The TSD states that the SNDs are the "key" to the agencies' interpretation of the CWA. However, a policy decision has been made, which conflicts with the TSD. An SND cannot be performed outside 4,000 feet from the ordinary high water mark (OHWM)/high tide line (HTL) of an (a)(1)-(a)(5) water under the draft final rule, which eliminates use of the "key method" in determining jurisdiction for such waters. The 4,000-feet limit arbitrarily cuts off which waters can be determined "similarly situated" under an SND, as (a)(8) waters cannot be aggregated with other waters beyond 4,000 feet even if they are truly "similarly situated," further limiting the use of the "key" factor under the final rule. The 4,000-foot limitation under (a)(8) conflicts with the TSD regarding the importance of connectivity. The Connectivity Report, produced by EPA to support the proposed rule recommended against using linear distance limitations to establish jurisdictional boundaries.

18. The TSD states that the 4,000-foot distance threshold limit for (a)(8) waters "will protect the types of waters that in practice have been determined to have a significant nexus on a case-specific basis." This statement is unbounded. The isolated JDs reviewed for the Economic Analysis by EPA to estimate the change in jurisdiction were originally considered under the 2003 *SWANCC* guidance; therefore, jurisdiction was determined based on whether there was an interstate/foreign commerce connection, the jurisdiction was not analyzed through a SND. None of the isolated JDs resulted in a positive determination of jurisdiction. The EPA did not review any of the agency-coordinated SND JDs and as such could not have estimated how many of the SNDs would include waters that would be covered under (a)(8) of draft the final rule. Approved JDs are not required to indicate the distance from the aquatic resource to the nearest tributary OHWM. Therefore, the potential impacts to jurisdiction as a result of the (a)(8) distance limit cannot be estimated and the Corps cannot corroborate the numbers or conclusions in the TSD.

19. The TSD describes that wetland functions and wetland proximity to downstream waters determine where wetlands occur along the connectivity gradient. The TSD states that the science demonstrates strong evidence supporting the connectivity of waters in varying degrees in maintaining the structure and function of downstream waters. The appropriate conclusion would be that an SND should be performed for all waters not determined adjacent to determine where they fall along the connectivity gradient and whether that nexus is significant. However, under the draft final rule, if the subject water is greater than 4,000 feet from the OHWM/HTL of an (a)(1)-(a)(5) water, even if they are within an area that lies along the connectivity gradient of the tributary and may be providing important functions to the downstream waters, an SND cannot be performed under the draft final rule and the water would be non-jurisdictional. Thus, the TSD contains conclusions that conflict with the language of the final rule

20. The TSD describes that wetlands with channelized surface or regular shallow subsurface connections demonstrate connectivity and provide functions that can be generalized and can affect downstream waters. A shallow subsurface or confined surface connection should be a factor in determining jurisdiction based on the discussion in the TSD. However, such factors are not able to be used under the draft final rule as a factor in an (a)(6) adjacency determination and cannot be used in establishing jurisdiction under a SND for waters beyond 4,000 feet from the OHWM/HTL of an (a)(1)-(a)(5) water. The TSD provides evidence of studies that indicate the "substantial" functions provided by non-floodplain wetlands. The draft final rule forecloses on the ability to do a SND on waters beyond 4,000 feet from the OHWM/HTL of an (a)(1)-(a)(5) water despite the potential presence of such "substantial" functions described by the TSD. This conflicting language serves as a basis for technical conflicts during implementation.

21. The TSD emphasizes that evaluations of individual wetlands should be considered in the context of other wetlands within the same watershed and emphasizes the aggregation of waters in the watershed. The TSD also emphasizes that wetlands complexes can be connected to downstream waters even if individual wetlands are isolated. As such, JDs for wetlands should consider the influence and effect in aggregate of other wetlands within the same watershed. However, the draft final rule does not allow for aggregation of (a)(6) waters when doing an SND for (a)(7) or (a)(8) waters, and does not allow for (a)(8) waters to be aggregated with waters beyond 4,000 feet from the OHWM/HTL of an (a)(1)-(a)(5) water. Caveats should be included regarding policy decisions that restrict and limit SNDs to the arbitrary distances and that limit the types of waters that can be aggregated within a watershed to reflect the situations where "in the region" and "similarly situated" are not allowed under the final rule.

22. The TSD emphasizes that the agencies undertook a very thorough analysis of the complex interactions between upstream waters and wetlands and the downstream rivers to reach the significant nexus conclusions underlying the provisions of the draft final rule. This does not comport with or support the policy decisions made to restrict aggregation and SNDs under the distance limits. Furthermore, the Corps was not part of any type of analysis to reach the conclusions described; therefore, it is inaccurate to reflect that "the agencies" did this work or that it is reflective of the Corps experience and expertise.

23. The TSD does not provide support for the determination of how "significance" will be measured in the SND or what is "more than speculative or insubstantial?" How is that quantified beyond the list of factors to be considered in the definition of the final rule? The TSD also does not provide clarity for how "similarly situated" is defined. The TSD contains clearer and consistent language than the language in the preamble regarding bed/banks and OHWM, as well as the discussion on breaks in those indicators not limiting upstream and downstream reaches of the tributary. There is potential for the language in the TSD to conflict with the language in the preamble; such language on these topics needs to be consistent and clear between the TSD and the preamble.

24. The document does not provide necessary support for the draft final rule language and cannot be used by the field in implementing the final rule. The TSD recognizes that floodplains

of large river systems are much greater than 4,000 feet from the OHWM/HTL of the river. Arguably, it is the expansive floodplains of the larger river systems that provide the important exchange between waters within the floodplain and (a)(1)-(a)(5) waters rather than a linear distance.

25. The Corps provided substantial technical comments on the draft EPA Connectivity Report, which are still valid with respect to the technical validity of the concepts presented in the TSD. Thus, with respect to the TSD, as with the Economic Analysis, the Corps cannot be identified as having been involved in performing the technical analysis or preparation the actual document. It is inaccurate to reflect that the Corps experience and expertise is reflected in the conclusions drawn within the document. All references to the "agencies" or to the Corps should be removed from the TSD and the sole author of the TSD is appropriately EPA.

26. In conclusion, it should be made clear by EPA within each document the sections or subject matter areas for which the Corps provided data, but the documents should not be characterized as anything other than analyses performed solely by the EPA. The Corps should not be identified as an author, co-author or substantive contributor to either document. Additionally, all references to the "agencies" in the documents should be removed as well as references to conclusions drawn based on the agencies' "experience and expertise."

27. The point of contact for this memorandum is Ms. Jennifer Moyer at 202-761-4598

Jennifer A. Moyer

JENNIFER A. MOYER
Chief, Regulatory Program

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
441 G STREET, NW
WASHINGTON, DC 20314-1000

REPLY TO
ATTENTION OF

CECW-CEO

15 May, 2015

MEMORANDUM FOR Assistant Secretary of the Army for Civil Works

JAB 15MAY15

THRU Commanding General and Chief of Engineers, US Army Corps of Engineers

SUBJECT: Economic Analysis and Technical Support Document Concerning the Draft Final Rule on Definition of "Waters of the United States"

1. I am forwarding the attached memorandum summarizing the Corps of Engineers' technical review of the Economic Analysis and Technical Support Document (TSD) produced by the Environmental Protection Agency (EPA), to support the on-going draft final rule on the definition of the "waters of the United States" (WOUS) under the Clean Water Act (CWA). The Corps received these final draft versions for the first time in the last two weeks. These documents were reviewed at my request by some of the Corps' most experienced experts in applying Section 404 of the Clean Water Act, including legal, regulatory, and scientific experts in the Corps Headquarters, Engineer Research and Development Center, and the Institute for Water Resources.

2. The Corps of Engineers' technical review indicates that both documents are flawed in multiple respects. The collective view of the Corps experts is summarized by our Regulatory Chief in the attached memorandum, which highlights the key aspects requiring your awareness, and deserving of your attention. To briefly summarize, our technical review of both documents indicate that the Corps data provided to EPA has been selectively applied out of context, and mixes terminology and disparate data sets. In the Corps' judgment, the documents contain numerous inappropriate assumptions with no connection to the data provided, misapplied data, analytical deficiencies, and logical inconsistencies. As a result, the Corps' review could not find a justifiable basis in the analysis for many of the documents' conclusions. The Corps would be happy to undertake a comprehensive review with the EPA to help improve these supporting documents, which we recognize are critical to the rule-making.

3. With respect to these two documents, the Corps provided the EPA with raw data on the overall numbers of jurisdictional determinations (JDs) made by the Corps for aquatic resources within the span of control of the Corps' regulatory program (i.e., Section 404 of the Clean Water Act), and provided similar raw data for the Technical Support Document. However, the Corps had no role in selecting or analyzing the data that EPA used in drafting either document. As a result, the documents can only be characterized as having been developed by the EPA, and should not identify the Corps as an author, co-author or substantive contributor. To the extent that the term "agencies" includes the Corps of Engineers, any such reference should be removed. Finally, the Corps of Engineers logo should be removed from these two documents. To either

imply or portray USACE as a co-author or contributor to these documents, other than as the provider of raw unanalyzed data, is simply untrue.

4. The Corps of Engineers fully recognizes the importance of this rule-making, and of these documents to underpin the content of the final proposed draft rule. We stand ready to assist the EPA in improving the technical analysis and to develop logically supportable conclusions for these documents, if and when requested.

Building Strong!

JOHN W. PEABODY
Major General, US Army
Deputy Commanding General
for Civil and Emergency Operations

Encl.

Compilation of Preliminary Comments from Individual Panel Members on the Scientific and Technical Basis of the Proposed Rule Titled "Definition of 'Waters of the United States' Under the Clean Water Act"

(As of August 14, 2014)

Dr. Allison Aldous

Responses to questions regarding the definition of "Waters of the United States" under the Clean Water Act.

Aug 13, 2014

The definition of Waters of the United States by the EPA and ACOE bases a determination of a "significant nexus" on the physical, chemical, and biological processes that connect and link wetlands waters to each other. These key processes are integral to the functioning of aquatic ecosystems, and the Rule is, for the most part, well grounded in ecological, hydrological, and other physical sciences.

The agencies appropriately recognize that "significant nexus" is not a scientific term and that "*there is a gradient in the relation of waters to each other*" (p. 22193). This gradient in connectivity runs from a continuous and significant physical and ecological connection, to an infrequent and insignificant connection. Specific scientifically-grounded, objective methods must be put in place to draw the line between those waters having or not having a significant nexus to other jurisdictional waters. In some cases methods and/or criteria are proposed, and often the agencies seek feedback on these approaches, implying that technical guidance will be issued after the Rule is complete. Nevertheless, evaluating the technical accuracy of the definition is difficult in the absence of clear criteria.

1. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment. This definition is based on the conclusion that a significant nexus exists between tributaries (as defined in the proposed rule) and the traditional navigable waters, interstate waters, and the territorial seas into which they flow. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

The agencies are correct that tributaries and their associated ecosystems significantly affect the chemical, physical, and biological integrity of downstream waters.

Under this proposed definition, tributaries include (i) stream-type (lotic) tributaries which are identified using the indicators of a bed and banks and ordinary high water mark (OHWM), and which also contributes flow, either directly or indirectly to a jurisdictional water; and (ii) stillwater-type (lentic) tributaries which may lack a bed and banks or OHWM, as long as they contribute flow to a jurisdictional water. Thus even though the criteria of bed, banks, and OHWM are useful for defining lotic tributaries, the only criteria that a tributary must have is that it contributes flow to a jurisdictional water.

The definition of the lentic-type tributary (contributing flow from wetlands, lakes, and ponds) is not the way in which tributaries are traditionally defined in the scientific literature. It also makes the definition of a tributary confusing because there might be stream-type tributaries without one or more of the indicators (bed, bank, OHWM) but which could still be considered a tributary within the lentic-type. The lentic-type of freshwater ecosystems that often are connected to jurisdictional waters might be better included within the group of "adjacent waters", as suggested on p. 22203.

The definition of the lotic-type tributary is appropriately comprehensive because it inherently includes ephemeral and intermittent streams (as well as perennial) streams. The former types are often overlooked

but ecologically important, particularly in arid landscapes with seasonal patterns of precipitation. However, there may be some types of tributaries, such as spring-fed streams, that lack an obvious OHWM because their groundwater sources dominate the water budget, are temporally stable, and so there is no fluctuation in the hydrograph to generate a "*line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear line on the banks…*" (p. 22202). Therefore the definition should be "*bed and bank, and sometimes an OHWM*".

2. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment, or tributary. This definition is based on the conclusion that a significant nexus exists between adjacent water bodies (as defined in the proposed rule) and traditional navigable waters, interstate waters, and the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

The agencies are correct that adjacent water bodies significantly affect the chemical, physical, and biological integrity of downstream waters.

An adjacent water is a regulatory term which means a connected water body (p. 22195). Under the proposed definition, adjacent waters can be continuous with other jurisdictional waters; separated from them by a dike, dune, berm, etc; or located within the floodplain or riparian zone of a jurisdictional water. Connections between adjacent waters and jurisdictional waters can be surface or shallow subsurface.

A shallow subsurface (groundwater) connection is appropriately included as a pathway by which adjacent waters are connected to jurisdictional waters. Groundwater connections among water bodies are very important for their integrity.

1. The definition of a "shallow subsurface connection" is not entirely clear, but through the examples listed on p. 22208 appears to be very shallow (i.e., in the soils) than to surficial geology (except in karst systems). Shallow unconfined aquifers provide hydrologic and chemical connections among many wetland types, often on reasonably short time scales (i.e., 1-20 years) and are critical to the integrity of these wetlands, so should be included within this definition. These types of shallow unconfined aquifers meet the criteria listed on p. 22208 in that they "exhibit a direct connection to the water found on the surface in wetlands and open waters". For example, a sand dune aquifer connects emergent marshes on the Oregon coast to the Coos Bay estuary and the nearshore coastal zone via shallow groundwater flowpaths (Jones 1992).
2. Groundwater is specifically excluded in the section on excluded waters; see comments below under question #4 for comments on this.
3. The agencies suggest distance as a metric to determine if a shallow subsurface connection significantly connects a water body to a jurisdictional water (p. 22207). However, some highly permeable soils/aquifers with high hydraulic conductivity and a strong topographic gradient can transport water and dissolved solutes over longer distances between upgradient and downgradient waters. Effects on the downgradient (jurisdictional) waters include, for example, a more prolonged and muted hydrograph and transport of dissolved compounds. In contrast, lower permeability soils/aquifers with low k in flatter landscapes will have a lesser effect over shorter distances. Therefore the determination of connection via shallow subsuface pathways must take into account gradient and soil and aquifer hydraulic properties as well as distance separating water bodies.
4. Shallow subsurface flows are specifically excluded as Waters of the US. While they are not water bodies as defined here, it is important to recognize that activities that occur on the surface above those subsurface flows, such as ground disturbance (e.g., logging, road construction), introduction of contaminants (e.g., oil spills, application of agricultural chemicals), or groundwater abstraction

(e.g., pumping shallow wells) will significantly affect the integrity of the downstream receiving waters (Brown et al. 2011).

3. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, 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 traditional navigable water, interstate water, or the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

The agencies are correct that many types of water bodies that are not included as tributaries or adjacent waters may significantly affect the chemical, physical, and biological integrity of downstream waters. It is technically appropriate to aggregate similar waters for this analysis, as their effects on downstream waters are often only measurable in aggregate. It is also appropriate to aggregate waters based on proximity to one another as well as functional similarities.

Given that the science is constantly evolving, it is preferable to have an adaptive process for making jurisdiction determinations, rather than a list of waters that are defined as jurisdictional (or not) from the outset.

The agencies ask a number of questions related to how a significant nexus analysis should be done. The method ultimately selected for aggregating waters geographically (i.e., "in the region") and functionally (i.e., "similarly situated"), and for making a significant nexus determination, must be based primarily on hydrologic principles, because hydrology is the key ecosystem driver for most other processes. This must include both surface hydrologic processes as well as subsurface (i.e., shallow groundwater) processes occurring with the soils and within any shallow unconfined aquifers that serve to connect surface water bodies to one another. The latter is often implied (e.g., p. 22214, bottom of 1st column) but not explicitly discussed.

Using the "single point of entry" watershed based on NHD watersheds appears to be an appropriate approach. However, the agencies suggest that for regions where there are few previously-defined jurisdictional waters that 10-digit HUCs be used (p. 22212). If this is the case, some of those HUCs may not contain a jurisdictional water, and so how would a determination be made?

In proposing ways that "other waters" might be found to be "similarly situated", the agencies suggest using the Omernik Level III ecoregions (p. 22215). These are not appropriate for this type of analysis. Although they are based on a number of physical and biological parameters, these ecoregions reflect patterns in terrestrial vegetation across the country and are less predictive of aquatic habitat types (Higgins 2003; Higging et al. 2005). For example, in an ongoing project in the Crooked River Basin, Oregon, the five headwater spring/ephemeral stream types cluster by basin and surficial geology in terms of their discharge rates, water chemistry, and flora. This basin spans the Columbia Plateau and Blue Mountains ecoregions. Other springs within the Columbia Plateau ecoregion (but outside the Crooked Basin) are much different in all of the characteristics listed above (Aldous et al., unpublished data). A more appropriate approach for aggregating wetland types should be based on hydrologic principles.

Alternatively, the agencies propose the Hydrologic Landscape Regions (HLR) approach for considering wetlands and waters to be similarly situated. This approach is based on hydrologic drivers rather than landscape patterns in terrestrial vegetation, and may be more appropriate. In the Crooked River Basin project listed above, the headwater spring/ephemeral stream types are closely correlated to Wigington and co-authors' (2013) HLR types (Aldous et al. unpublished data).

4. The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions.

As described above, groundwater connections, particularly via shallow flowpaths in unconfined aquifers, are critical in supporting the hydrology and biogeochemical processes of wetlands and other waters, and they serve to connect waters and wetlands when they have no apparent surface connections. This is recognized in part in the Rule, yet not to the extent that these flowpaths are integral to supporting Waters of the US. Furthermore, groundwater is on the list of excluded waters. More clarity is needed in how groundwater is considered in making a jurisdictional determination, and a more inclusive definition is required that incorporates more than just shallow subsurface flow in soils.

Prior converted cropland is excluded from the list of jurisdictional waters. Cropland that historically was wetland, and is being restored to wetland, should not be excluded from the list of jurisdictional waters. It is not clear if this is included or excluded.

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Dr. Genevieve Ali

I would like to start by congratulating the EPA and the U.S. Army Corps of Engineers for putting the draft rule up for discussion to the public as well as the scientific community. It is true that many determinations of jurisdictional waters have been traditionally made on a case-specific basis rather than using a predetermined framework for categorical (or automatic) determinations; the agencies' efforts to make the determination process more straightforward, consistent and transparent are therefore highly commendable. My answers to the charge questions can be found below.

4. The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions.

Here I chose to answer the fourth charge question first as it addresses the "definition of other terms"; including that of "significant nexus". The draft rule does include a definition for "significant nexus"; however, I find it rather vague and subject to interpretation. Indeed, the EPA science report made a very eloquent demonstration that connections exist between streams and wetlands, regardless of whether they are at the head of a hydrographic network or not, and located in riparian and floodplain settings or not. The science report also made a very strong case for the multiple nature of those connections with biological, chemical, and hydrological exchanges, and with surface and subsurface components in some cases. The SAB panel tasked with reviewing the science report went on to discuss that connectivity expresses itself over a continuum or gradient and as such, it is reasonable to assume that "all is connected" to a certain extent, although the magnitude, frequency and duration of the connections are highly variable. The EPA science report did not, however, explicitly discuss the notion of significance, and I find that the definition provided in the draft rule does not resolve the issue as it equates "***significant***" with "***significantly affects*** the chemical, physical, or biological integrity" of a jurisdictional water, therefore never explaining what the root term "significant" means. The proposed rule goes on to say that "*for an effect to be significant, it must be more than speculative or insubstantial*", but it does not put forward any threshold for deciding what is *not* speculative or insubstantial. This definition of "significant nexus" is especially problematic when it comes to the "other waters" and the case-specific analyses needed to determine jurisdiction. The proposed rule would be more robust if the definition of "significant nexus" itself hinted at a tangible tool or methodology to make the job of the Corps Districts more straightforward and transparent when it comes to deciding what is *not* speculative or insubstantial.

I understand that the phrase "significant nexus" is a legal term: however, this concept needs to be quantified as objectively as possible in order to secure a consistent implementation of the proposed rule. Although the Agencies made it clear that they did not want to rely on specific flow rates, etc. to define the "significance" of a nexus, it would be important to clarify the meaning of the word "significant" here. Is the significance of a nexus evaluated in terms of the magnitude of connections, frequency, duration or all of the above? What about predictability? The example of Prairie potholes and their significant nexus to downstream waters is an interesting puzzle related

to that question as some body of literature has argued that potholes might attenuate "hydrological" floods but have no impact on so-called "economic" floods. In that literature, "hydrological" floods are considered by high frequency, low to medium magnitude events that occur commonly without economic damage while "economic" floods are low frequency, high magnitude events that tend to cause economic damage. If relying on that literature and on the "significant nexus" language contained in the proposed rule, I fear that it would fall on the local Agencies' shoulders to resolve the following questions/dilemma:

- Hydrological floods occur 4 out of 5 years but move relatively little water out of the potholes: there is a frequent nexus but is it significant?
- Economic floods have a 1 in 100 or 1 in 500 years recurrence interval and have catastrophic consequences downstream as water spills out of the potholes and reaches streams and rivers: there is an infrequent nexus but it is quite strong; is it, then, significant?

Another question that comes to mind is: since the CWA concerns the chemical, physical and biological integrity of (downstream) waters, do all three types of integrity need to be threatened simultaneously for the nexus to be deemed significant, non-speculative or substantial? Besides, an additional element of complexity (or uncertainty) has to do with whether the significance of a nexus should be measured in terms of socioeconomic impact as well. Indeed, under the existing regulations, ''other waters'' can be deemed jurisdictional if their use, degradation or destruction could affect interstate or foreign commerce, thus hinting towards a possible social assessment of the significance as well. At one point in the draft rule we can read that "*a case-specific analysis allows for a determination of jurisdiction at the point on the gradient in the relationship that constitutes a ''significant nexus''*. I would be in favor of more guidance being provided within the framework of the draft rule to facilitate that "critical point" or "threshold" determination and there again make the process more transparent to the public.

While the connectivity-related literature does not use the term ''significant'', this term has mathematical (or statistical) meanings and it would be important for the Agencies to assess whether they can work with those meanings/definitions or not. For instance, the concept of "statistical significance" is usually associated with a statistical test and rejecting a null hypothesis and would not be of any use here. However, another interesting concept is that of "practical significance", which basically asks the question of whether the differences between two groups of data are big enough to have **a real meaning**. I find that the concept of "practical significance" could be applied to the "significant nexus" idea as the notion of significance here is relative, i.e., the word "significant" is used to signify "with respect to" or "in comparison to" a system devoid of downstream connections. Each category (by rule) of jurisdictional water (e.g., tributaries, adjacent waters) could be associated with a very simple "Nexus Score" calculated as follows:

$$\text{Nexus Score} = \text{Score}_{\text{Chem}} + \text{Score}_{\text{Phys}} + \text{Score}_{\text{Biol}} + \text{Score}_{\text{Comm}} \qquad (1)$$

The individual scores $\text{Score}_{\text{Chem}}$, $\text{Score}_{\text{Phys}}$, $\text{Score}_{\text{Biol}}$ and $\text{Score}_{\text{Comm}}$ appearing in Equation (1) would have been derived from a site-specific assessment done using the framework outlined in Table 1:

Table 1: Components of the Nexus Score for a given water

Does the water...	If answer is "No"	If answer is "Yes"			
		Frequency (freq) of connection	Magnitude (mag) of connection	Duration (dur) of connection	Total score
... affect the **chemical (chem)** integrity of downstream waters?	$\mathbf{Score_{Chem}} = 0$	Low: $z_{freq} = 1$ Medium: $z_{freq} = 2$ High: $z_{freq} = 3$	Low: $z_{mag} = 1$ Medium: $z_{mag} = 2$ High: $z_{mag} = 3$	Low: $z_{dur} = 1$ Medium: $z_{dur} = 2$ High: $z_{dur} = 3$	$\mathbf{Score_{Chem}} = z_{freq} + z_{mag} + z_{dur}$
... affect the **physical (phys)** integrity of downstream waters?	$\mathbf{Score_{Phys}} = 0$	Low: $z_{freq} = 1$ Medium: $z_{freq} = 2$ High: $z_{freq} = 3$	Low: $z_{mag} = 1$ Medium: $z_{mag} = 2$ High: $z_{mag} = 3$	Low: $z_{dur} = 1$ Medium: $z_{dur} = 2$ High: $z_{dur} = 3$	$\mathbf{Score_{Phys}} = z_{freq} + z_{mag} + z_{dur}$
... affect the **biological (biol)** integrity of downstream waters?	$\mathbf{Score_{Biol}} = 0$	Low: $z_{freq} = 1$ Medium: $z_{freq} = 2$ High: $z_{freq} = 3$	Low: $z_{mag} = 1$ Medium: $z_{mag} = 2$ High: $z_{mag} = 3$	Low: $z_{dur} = 1$ Medium: $z_{dur} = 2$ High: $z_{dur} = 3$	$\mathbf{Score_{Biol}} = z_{freq} + z_{mag} + z_{dur}$
... use, degradation or destruction affect interstate or foreign **commerce (comm)**?	$\mathbf{Score_{Comm}} = 0$	$\mathbf{Score_{Comm}} = 3$			

In this framework, the maximum possible Nexus Score attainable by any water would be 30. The Nexus Score equation (Equation (1)) could even be re-written by multiplying the different individual scores by different weights:

$$\text{Weighted Nexus Score} = W_{Chem} \times Score_{Chem} + W_{Phys} \times Score_{Phys} + W_{Biol} \times Score_{Biol} + W_{Comm} \times Score_{Comm} \quad (2)$$

With W_{Chem}, W_{Phys}, W_{Biol} and W_{Comm} being user-defined weights between 0 and 1. Ideally, the weights would need to make consensus either through public consultation or based on literature reviews. One could foresee that if the assessment was done in a region where downstream populations are dependent on water supply for drinking water, for example, the physical and chemical integrity scores could have a higher weight than the biological integrity score.

A decision matrix like the one in Table 2 could then be used to assess an "other water" by comparing it to well-documented jurisdictional and non-jurisdictional waters:

Table 2: Practical significance of "other water" Nexus Score

	Nexus score of the well-documented water	Nexus score of the "other water" being assessed	% difference between the well-documented water and "other water" Nexus Scores
Tributary example	24	16	-33%
Adjacent water example	20		-20%
Non-jurisdictional water example	9		+78%

The tributary, adjacent water and non-jurisdictional water examples included in Table 2 would need to be similarly situated (based on hydrologic landscape regions or ecoregions) as the "other water" being evaluated. Then, by relying on "practical significance" principles, a significant nexus could be deemed present if:

- The (unweighted) Nexus Score of the "other water" is more than 25% higher (for example) than that of the similarly situated non-jurisdictional water; or
- The (unweighted) Nexus Score of the "other water" is equal or greater than that of any of the similarly situated jurisdictional waters.

For regions that are very well documented, the Corps Districts could even forego the practical significance assessment and just decide on a threshold (or critical) Nexus Score value (between 1 and 30) above which "significance" would be deemed present.

The (very coarse) idea of a Nexus Score (weighted or unweighted) builds upon the EPA science report and the scientific literature stating that "all is connected" to a certain extent in watersheds. The (very coarse there again) practical significance assessment outlined above however has the advantage of showing how the nexus of an "other water" compares to that of jurisdictional and non-jurisdictional waters before making a decision about its significance. By no means do I suggest that the Agencies adopt the approach outlined above, but relying on criteria, scores and a decision matrix of some sort would make the "significant nexus" decision more understandable and more objective to the public.

Still on the topic of definitions within the proposed rule, beyond the word "significant", the term "nexus" should be explained more clearly (i.e., what is a nexus, regardless of whether it is significant or not?). From the proposed rule, it is sometimes unclear to me whether nexus = connection or nexus = impact or influence? With the former definition, only connectivity is deemed important while with the latter, both connectivity and isolation can have an impact on downstream waters. At one point in the rule, we can read: "*Connectivity for purposes of interpreting the scope of ''waters of the United States'' under the CWA serves to demonstrate the ''nexus'' between upstream water bodies and the downstream traditional navigable water, interstate water, or the territorial sea*": this statement strongly downplays the beneficial effects of the isolation of some waters from downstream waters. There again, the EPA science report made a great job in citing literature that shows that the isolation of certain "other waters" can be critical to the health/integrity of downstream waters, and it might be important to reiterate that fact by

clarifying what a nexus is. The draft rule rightfully mentions that functions that might demonstrate a significant nexus include sediment trapping, retention or attenuation of flood waters, etc. and those functions all refer to isolation: those clarifications would however carry more power if they were closely associated with the definition of a "nexus" *per se*.

Lastly, about the definition of a wetland, it seems that the wording included in the draft rule is not aligned with that of the EPA science report. Indeed, the draft rule mentions that wetlands are "*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*". This slightly deviates from the science report which relied on the Cowardin definition and required only one out of the three Cowardin criteria to select wetland-related literature. At the time of the SAB panel discussions in Washington D.C., there were also multiple discussions regarding the use of a broader Cowardin definition (only one out of three criteria) that was not aligned with the current federal regulatory wetland definition (based on all three Cowardin criteria). The Agencies should clarify how the new wetland definition agrees with (or contradicts) not only the current federal regulatory definition but also the approach that was used in the science report that serves as a basis for the new rule.

1. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment. This definition is based on the conclusion that a significant nexus exists between tributaries (as defined in the proposed rule) and the traditional navigable waters, interstate waters, and the territorial seas into which they flow. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

Overall, I agree with all tributaries of a traditional navigable water, interstate water, the territorial seas or impoundment being jurisdictional. The scientific literature reviewed in the EPA science report supports the argument that tributaries, as a category, are involved in tremendous exchanges with downstream waters and as such, they do not need to be subject to individual case-by-case evaluations before they are deemed jurisdictional. Even though the current version of the EPA science report does not address man-made/artificial waterways, I also agree with the identified features that could qualify as jurisdictional ditches, namely natural streams that have been altered, ditches excavated in jurisdictional waters, ditches that have perennial flow and ditches that connect jurisdictional waters.

In light of one of the objectives pursued with this new rule, i.e. a more consistent and transparent determination of jurisdictional waters, I think that the inclusion of a regulatory definition of "tributary" is great. However, I am not sure that the majority of the literature supports the categorization of run-of-stream wetlands and lakes as tributaries, especially since the majority of the literature defines tributaries as longitudinal features that have directional flow. In the draft rule itself, it is somewhat confusing to define a tributary as "*a longitudinal surface feature that results from directional surface water movement and sediment dynamics demonstrated by the presence of bed and banks, bottom and lateral boundaries, or other indicators of OHWM*" and still call run-of-river wetlands and lakes tributaries when they do not fit that definition. The agencies did

recognize that uncertainty and said they could rather categorize wetlands that connect tributary segments as adjacent waters rather than tributaries: I favor that option. Also, the EPA science report was well structured with 1) streams, 2) riparian and floodplain wetlands, and 3) non-riparian and non-floodplain wetlands and I think that the proposed rule should build upon that structure and consider, separately, 1) tributaries = streams, 2) adjacent waters in riparian and floodplain areas, including run-of-river features, and 3) other waters in non-riparian and non-floodplain areas.

2. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment, or tributary. This definition is based on the conclusion that a significant nexus exists between adjacent water bodies (as defined in the proposed rule) and traditional navigable waters, interstate waters, and the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

I support the change from ‘‘adjacent wetlands’’ to ‘‘adjacent waters’’ in the proposed rule because it is more aligned with the contents of the EPA science report that the proposed rule relies on. By using a broader Cowardin definition to select wetland-related literature, the science report in fact considered multiple types of water bodies (e.g., oxbow lakes) located in riparian and floodplain settings. Equating the term “neighbouring” with “being located in (the same) riparian or floodplain area” is also aligned with the EPA science report.

I also agree with the statement that “*for waters outside of the riparian area or floodplain, confined surface hydrologic connections (as described above) are the only types of surface hydrologic connections that satisfy the requirements for adjacency.*” To me, this does not mean that waters outside of the riparian area or floodplain and without confined surface hydrologic connections necessarily lack a significant nexus but simply that they cannot be considered as adjacent waters and rather need to be considered as “other waters” and be evaluated on a case-by-case basis.

The Agencies did request comments about how to deal with shallow subsurface flow connections when determining adjacency. They considered four options, namely:

1. Asserting jurisdiction over adjacent waters only if they are located in the floodplain or riparian zone of a jurisdictional water;
2. Considering only confined surface connections but not shallow subsurface connections for purposes of determining adjacency;
3. Establishing specific geographic limits for using shallow subsurface or confined surface hydrological connections as a basis for determining adjacency, including, for example, distance limitations based on ratios compared to the bank-to-bank width of the water to which the water is adjacent; or
4. Asserting jurisdiction over all waters connected through a shallow subsurface hydrologic connection or confined surface hydrologic connection regardless of distance.

Option (1) is the one that the proposed rule currently puts forward, and I find that it is the most aligned with the EPA science report. In my opinion, option (2) is too limiting and disregards the very large body of literature demonstrating the importance of shallow subsurface flow paths,

especially in riparian and floodplain settings. Option (3) is a good idea but the ratios mentioned would likely be site-specific and may be correlated to riparian and floodplain morphology, thus making option (1) a much easier and straightforward one to implement. As for option (4), I find it to be the most impractical as it would be difficult to test the presence of unbroken, perennial or intermittent shallow subsurface connections over long distances.

3. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, 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 traditional navigable water, interstate water, or the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

The approach put forward by the proposed rule, i.e. that waters not located in riparian and floodplain settings be assessed on a case-by-case basis, is well aligned with the EPA science report: while the presence of a nexus is not contested, the demonstration of its significance has to be made.

The draft rule mentions that the agencies "*considered multiple approaches and options for how best to address whether ''other waters'' were jurisdictional under the CWA*", including determining, "*by rule, that ''other waters'' are similarly situated in certain areas of the country*". I agree that ecoregions and hydrologic landscape regions (HLRs) could be used for aggregation purposes. Those concepts are widely used for research purposes and could become powerful regulatory tools by providing a scientific equivalent to the phrase "similarly situated" that was used in previous court rulings and decisions.

Still in relation to "other waters", the draft rule mentions that the agencies considered the possibility of determining "*by rule that certain additional subcategories of waters would be jurisdictional rather than addressed with a case-specific analysis*". The draft rule builds on the examples of "*waters such as prairie potholes, Carolina and Delmarva bays, pocosins, Texas coastal prairie wetlands, and western vernal pools*" that could be deemed jurisdictional, as a category, while "*playa lakes in the Great Plains, even in combination with other playa lakes in a single point of entry watershed*" would be considered non jurisdictional for they lack a significant nexus. I am a bit reluctant about this option and do not think that the currently available scientific literature supports that approach. The draft rule goes on to say that "*the [EPA science] Report indicates that there is evidence of very strong connections in some subcategories that are not included as jurisdictional by rule*" but there again, it is unclear to me whether that very qualitative terminology ("very strong") is a synonym for "significant". Having other groups or types of waters being determined jurisdictional by rule or category would only be possible if we could rank them according to the frequency and/or magnitude and/or duration with which they actively transfer materials (or prevent the transfer of materials) to downstream waters (see coarse schematic in Figure 1).

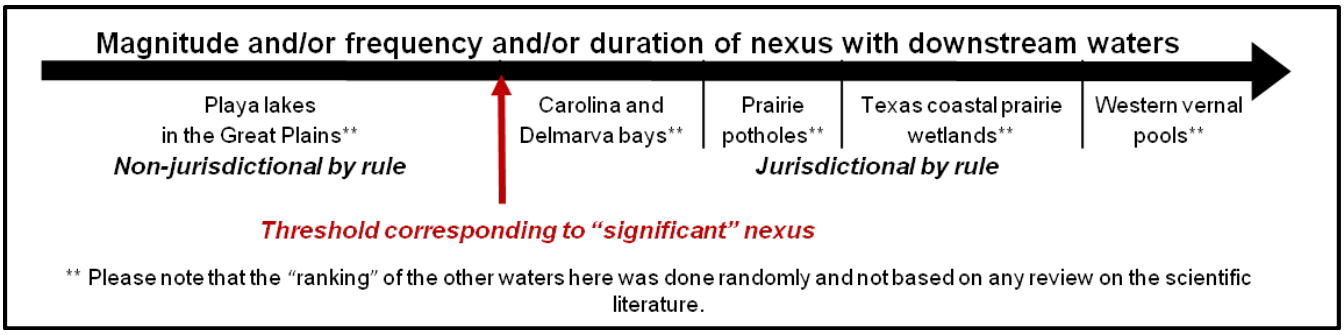

Figure 1: Hypothesized/idealized ranking of other waters according to their nexus to downstream waters

While reviewing the EPA science report, the SAB panel discussed – at length – the issue of connectivity being a gradient rather than a dichotomous property, and the issue with "other waters" is that they can be on both extremes of the spectrum (or gradient), i.e. be strongly connected or strongly isolated from downstream waters depending on the prevailing conditions. This makes the assessment of "significant nexus" particularly difficult and until (or unless) rankings or classifications similar to the one hypothesized in Figure 1 are available, I do not think that it would be possible to determine that certain additional subcategories of waters are jurisdictional by rule.

5. If you have any other comments about the adequacy of the scientific and technical basis of the proposed rule, please provide them as well.

Just a quick comment about fill and spill hydrology: This is a detail which I do not believe has a major impact on the legal implications of the proposed rule but I do not agree with the definition of "fill-and-spill" that is used in the document. Indeed, the document reads that:

"*For the purposes of [this] rule, ''fill and spill'' describes situations where wetlands or open waters fill to capacity during intense precipitation events or high cumulative precipitation over time and then spill to the downstream jurisdictional water.*"

However most of the literature on fill-and-spill deals with subsurface flow connections over irregular soil-bedrock interface or Prairie potholes and in such cases, the phrase "fill and spill" simply means that water is going over the rim of the pothole or subsurface depression; it does not necessarily mean that the water spilling over in fact discharges into a jurisdictional water. When modelling "fill and spill", most algorithms go with a four-phase sequence from dry → fill → spill → connect: the "connect" phase corresponds to a spill large enough that it actually reaches a stream. It should be clarified in the proposed rule that some spills occur very far from jurisdictional waters (i.e., in uplands) and in fact never reach or influence downstream waters.

Dr. David Allan

Statement of J. David Allan regarding EPA's Proposed Rule "Definitions of "Waters of the United States' Under the Clean Water Act".

The Federal Register (vol 79 No. 76, April 21, 2014) reporting of the proposed rule and supporting science is excellent. It thoroughly covers the supporting science, and defines each of the elements of "significant nexus". I believe the proposed rule and its supporting language define to the greatest degree possible which waters are jurisdictional under the CWA, and set forth the criteria by which "other waters" may be determined to be jurisdictional on a case by case basis. Yet to be resolved in whether broad categories of "other waters" may be considered jurisdictional as a category.

Those waters to be excluded deserve careful scrutiny as there is no recapture provision following this rule-making. I wish to raise possible concerns regarding Exclusion b (3) and Exclusion b (5-vi).

Exclusion b (3) – "ditches that are excavated wholly in uplands, drain only uplands, and have less that perennial flow" – together, these three criteria may suffice, but the distinction between perennial and less-than-perennial flow may be a cause for concern. P 22203 states, "Under this exclusion, water that only stands or pools in a ditch is not considered perennial flow and therefore any such upland ditch would not be subject to regulation". In parts of southeast Michigan, Ohio and Indiana, topography is very flat and ditches flow primarily during times of heavy rain. Some ditches are sufficiently deep that they will pond water until the receiving river stage drops enough for water to flow from the ditch to the river. Yet such ditches commonly receive from surrounding lands, and episodically deliver, significant nutrients to downstream waters. In the aggregate, they are the source/conduit for the majority of contaminants reaching downstream waters ("most of the materials found in rivers originate outside of them." P 22247). Indeed, this situation describes much of the drainage into western Lake Erie, where harmful algal blooms due to excessive nutrient loading have caused beach closings, and in August 2014 a three-day ban on drinking water for some 400,000 of the residents in and near Toledo, OH. In short, using the criterion of "less-than-perennial" flow to exclude ditches may not be consistent with addressing nutrient and sediment loading that affects drinking water, beach use, fishing, and other uses.

Exclusion b (5-vi) – "Groundwater, including groundwater drained through subsurface drainage systems". An important pathway for some nutrients and contaminants is via subsurface drainage systems to ditches that may not have perennial flow, but which may deliver much of the nonpoint runoff to downstream waters. Thus this exclusion is a concern, and should be recognized as such.

The aggregate influence of these two exclusions can be estimated by models such as SWAT, which then might serve as a basis for determining when these exclusions have sufficient impact to be considered.

If the agencies prefer criteria related to flow regime rather than the delivery of non-point pollutants, they might consider aggregate flow during a 90-day window spanning the time of fertilizer application.

Dr. Emily Bernhardt

> Comments on the adequacy of the scientific and technical basis of the proposed rule titled Definition of Waters of the United States Under the Clean Water Act (79FR 22188-22274)

I want to begin my comments by complimenting the authors of this new rule on preparing a cogent, clear and well reasoned set of clarifications on the critically important policy issue of the definition of waters of the United States. I believe that this rule will, as intended, greatly simplify permit application and regulatory procedures for the administration of the CWA. The authors have done an excellent job laying out the need for and purpose of this new rule; detailing and explaining the changes in the rule; and providing a concise and well-cited summary of the scientific literature that underpins these new guidelines.

In regards to *Question 1 – Definition of tributaries as Waters of the United States:* I am very pleased to see that the policy language is now consistent with the best available science and simple common sense. Every tributary stream of a navigable water, whether it carries permanent or occasional flow, is now explicitly recognized as a water of the United States. It is well known that the materials delivered by headwaters provide essential energy and nutrient resources to the biota of downstream waters, and also that pollutants that enter tributaries must inevitably be transported downstream. Thus in order to protect the chemical and biological integrity of major rivers, it is essential to protect the chemical, physical and biological integrity of contributing tributaries and of any bodies of water (lakes, ponds, wetlands) that are connected within these tributary networks. This section of the rule was quite clear and unequivocal and is entirely consistent with the body of scientific literature in hydrology, aquatic ecology and aquatic chemistry. I appreciate that the rule explicitly recognizes that "manmade breaks" (bridges, dikes, dams) or extreme alterations of channels (e.g. piping, damming) do not alter the potential of that water conveyance to affect downstream waters and thus do not affect its jurisdictional status. As the rule states clearly and simply "*The discharge of a pollutant into a tributary generally has the same effect downstream whether the tributary waterway is natural or manmade"*.

In regards to *Question 2 – Definition of adjacent waters and wetlands as waters of the United States:* The newly worded rule places protections on all waters of the United States that are adjacent to (~ bordering, contiguous or neighboring) a navigable water or any of its tributaries. A critically important feature of this new wording is that any water within the riparian zone or floodplain of a stream or river is recognized as a water of the United States, even in the absence of a direct surface water connection. Since, by definition, water bodies situated within floodplains are engulfed by occasional floods, it is an important improvement to recognize that the water, biota and chemicals within these systems are at least episodically hydrologically connected to downstream waters. This argument could be further strengthened by explicitly acknowledging that water bodies alongside streams or river are quite likely to be connected to those systems through extensive subsurface hydrologic exchange. The authors should consider whether they can provide further guidance in how the term floodplain is to be defined. There are considerable differences in the scope of protection depending upon whether regulators consider a 1 year or 500 year flood return interval to delineate a floodplain. Being more explicit about how a floodplain should be defined would allow for more consistent application of the rule.

In regards to *Question 3 – Definition of other waters on a case-by-case basis as waters of the United States:* Having clarified the status of all tributaries and all waters adjacent to tributaries as waters of the United States, the authors are left with the challenge of determining what water bodies outside of these categories must also be protected in order to maintain the physical, biological and chemical integrity of

downstream waters. The rule acknowledges that as water bodies become more distant from tributaries and rivers, the extent of their connectivity also declines. It would be useful for the rule to also mention that the size of these water bodies matters as well, small water bodies far from any flowing water system are more isolated (both hydrologically and via transfers of biota) than are large water bodies that are closer. I appreciate that the rule makes a strong case for considering that the aggregate effect of many minimally connected water bodies may be critical for maintaining the biological, chemical and physical integrity of water bodies in one or both of the previous, clearcut categories of jurisdictional waters. Many watersheds have a large number of non-floodplain wetlands that are collectively responsible for the maintenance of baseflows; the attenuation of floods; the production of organic material that fuels downstream food webs; and the trapping or removal of sediments, nutrients and contaminants that would otherwise contribute to the degradation of downstream water quality. Although individually these wetlands may each have minimal connections to downstream waters, the cumulative impact of these diffuse connections is tremendously important to the maintenance of downstream biota and ecosystem integrity. Historically, the destruction of wetlands has caused serious declines in the water quality of U.S. waters and it is crucial that our CWA works to prevent similar degradation in the future. I found the list of criteria that could be used to assess whether an “other water” was connected to downstream waters was comprehensive, reasonable, and well articulated. I found the text of the rule in this section very close in spirit, substance and argument to SRB panel discussion and recommendations on this issue.

Dr. Robert Brooks

Brooks comments on proposed rule: Definitions of Waters of the United States … 7-28-14

22193 (column 1)- bullet – All *impoundments*…

Does this apply only to human impoundments, or also those caused by beaver activities, substantial debris dams, and/or geological events, such as landslides or subsidences?

22193 (col. 2) – Use of the term *gradient* – is appropriate, and should be linked to our review of the science report diagram of gradients.

22193 (co. 3) – *Groundwater* is expressly excluded as a water. (Same as in rule itself:

22251(col. 1) – In this section on *vernal pools*, there is emphasis given to Western vernal pools, with accompanying citations. Eastern vernal pools seem to get short shrift, so additional literature should be included for this type of water.

22263 Sec. 328.3 Definitions – (b)(5)(vi) – Groundwater…)

This seems ill-advised because of the likely connectivity of surface flows into features such as karst sinkholes, with a potential to contaminate groundwater aquifers used for human water supplies, plus the possibility of reconnections to surface water a reasonable distance away.

22263 – *adjacent, riparian area, floodplain, tributary*

I concur with the definitions provided for the above terms. However, from 22199 (bottom column 2), I recommend including the additional description …"the term "adjacent" to includes waters located within the riparian area or floodplain of a water …". This clarifies that these waters are jurisdictional by definition without need of demonstrating a significant nexus.

General comment: Although burdensome, for consistency between the science report (and our committee's recommendations) and the proposed rule, revisions to the science report should be substituted for the text of Appendix A. For example, this will remove confusing terms such as unidirectional and bidirectional wetlands, and provide updated literature, which provides further evidence of connectivity to downstream waters.

Dr. Kurt Fausch

Comments by Kurt D. Fausch on the proposed rule: "Definition of 'Waters of the United States' Under the Clean Water Act"

I read the proposed rule published in the Federal Register, and focused specifically on the portions that addressed tributaries to the Nation's waters, and on how these affect biological integrity of downstream waters. These are my areas of particular expertise.

Overall, I found that the rule was written clearly, and identified the specific conditions by which these tributaries affect the biological integrity of downstream streams and rivers. In Appendix A, I found that these connections were well supported by relevant examples from the primary scientific literature.

I found no sections in the material on tributaries that presented statements that were not accurate or consistent with the scientific literature.

In summary, with regard to the information supporting the assertion that tributaries as a water body type are connected to downstream waters and affect their physical, chemical, and biological integrity, the rule is clearly written and this assertion is well supported by the scientific literature.

Dr. Michael Gooseff

Preliminary Written Comments on proposed new EPA CWA rule.

13 August 2014

1. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment. This definition is based on the conclusion that a significant nexus exists between tributaries (as defined in the proposed rule) and the traditional navigable waters, interstate waters, and the territorial seas into which they flow. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (*lead discussants are: Drs. Emma Rosi-Marshall and Jennifer Tank*)

This is a reasonable linkage to make. We generally understand that headwaters flow into higher order, larger streams and eventually into rivers, moving down the river network. This obvious connectivity directly implies that the degradation of any point of the network will cause some change to the downstream parts of the network, where the covered waters are found. The converse is also true – that the improvement of quality of tributaries can also improve the quality of downstream waters. The condition of a stream or river is not solely a function of tributary conditions, but upstream tributaries provide the greatest amount of stream flow (and dissolved and suspended material loads) to downstream waters, and therefore, tributaries are generally accepted to have a significant influence on downstream conditions.

2. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment, or tributary. This definition is based on the conclusion that a significant nexus exists between adjacent water bodies (as defined in the proposed rule) and traditional navigable waters, interstate waters, and the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (*lead discussants are: Drs. Siobhan Fennessy and Mazeika Sullivan*)

The qualification of neighboring water bodies to covered waters is reasonable. It is rare, if ever, to find no connection between the covered water body and those that are within the riparian zone or floodplain of the water body. One challenge here, however, is that the reference to floodplains and riparian zones ultimately infers connectivity of a stream or river to water bodies within these adjacent regions. A reasonable question to ask is to what similar extent should other water bodies (e.g. lakes) have significant nexus with neighboring water bodies? Lakes, for example, may have a definable riparian zone, but rarely have “floodplains” or high water marks that induce such a dynamic change in stage and width of the surrounding area as the

floodplains of streams and rivers. While great size is not necessarily a requirement of such consideration, it seems likely that the typical geomorphic position of lakes (as low points in the local area) lend themselves to physical connection via defined surface flow or shallow subsurface flow to neighboring water bodies (streams, ponds, wetlands, etc.). Biological connections are perhaps more likely among neighboring water bodies and non-stream or river waters as different water bodies may provide different habitat conditions for different life stages, prey communities, etc.

3. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, 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 traditional navigable water, interstate water, or the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (*lead discussants are: Drs. Emily Bernhardt and Michael Gooseff*)

I interpret this to mean that the other waters are those that are not neighboring. When this is the case, it seems the significant nexus concept provides two extreme opportunities to determine jurisdiction of a single other water body under the CWA – 1) assume all other waters are under jurisdiction of the CWA until otherwise proven to have no significant nexus [though may have some nexus regardless], and 2) assume all other waters are not under the jurisdiction of the CWA until otherwise proven to have a significant nexus to a covered water body. The approach of the new rule provides a reasonable intermediate, that a case-specific assessment must be made to determine whether and what sort of nexus may exist between the water bodies (physical, chemical, and/or biological), and how significant the nexus is. Connections between other water bodies and covered waters may be infrequent and may be invisible at the surface because of a groundwater-mediated exchange of mass and energy between the water bodies. This may indeed prove to be either significant or less than significant after assessment. In my opinion, the case-specific analysis still provides the opportunity for the determination to go either way, rather than de facto categorization (the two cases suggested above) that would have to be overturned to determine the true state of the other water body. Ultimately, the variety of these water bodies and the potential connection types, strengths, and frequencies will determine both whether and how significant any connection could be. This variety of possibilities makes it difficult if not impossible to broadly categorize connection type and significance.

4. The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions. (*lead discussants are: Drs. David Allan and Mark Rains)*

The determination of waste treatment systems, converted cropland, upland ditches with no direct connection to a covered water body, reflecting pools and swimming pools, ornamental waters, and rills and gullies, and water-filled depressions from construction activities as specific exclusions of the CWA jurisdiction seem reasonable to me. I question two of these exclusions in part – 1) artificial lakes and ponds and 2) groundwater. Firstly, I recognize that artificially generated stock ponds, irrigation ponds, settling basins, or rice ponds are generated for specific anthropogenic and utilitarian reasons. However, assuming de facto that they have no connection to a downstream water without any assessment is an over simplification of most systems. What happens when any of these artificial water bodies over flow? A low frequency connection between these water body types could occur via a direct surface connection. The flux of material (solutes, sediment, etc.) may impair the receiving water body, thereby degrading the physical, chemical, and/or biological status of the receiving water, even if temporary. I am not sure of a solution to this issue, but it seems that these are likely to be similarly situated to other water bodies that may be considered adjacent without being considered to be neighboring and a case by case analysis of these may be warranted for similar reasoning. Secondly, I generally agree that groundwater, sourced from infiltration at locations distal to the covered water body is reasonably out of jurisdiction of the CWA, particularly because groundwater is regulated separately. However, it is well recognized that one often found connection between water bodies is that of a shallow subsurface flow path. Is infiltrating surface water considered groundwater or not? This is a reasonable question to debate. Hyporheic zones of streams and rivers are characterized by a mixing of two waters: surface water and groundwater. But if the surface water has left the channel by following hydraulic gradients that force it into the subsurface, is it still surface water? How long does it need to be in the subsurface to become groundwater? Infiltrating surface water carries with it the energy (i.e., temperature), chemical, and biological signatures that it had at the surface, and some of these change quickly and some change slowly in response to reactions with subsurface constituents, interactions with microbial communities, redox gradients that drive chemical species change, and mixing with groundwater (in this case, water that infiltrated from precipitation distant from the water body and floodplain and has been slowly transported through an aquifer or series of aquifers to the subsurface vicinity of the surface water body). In the case of hyporheic ***exchange***, at least some proportion of the water that left a stream channel will come back to the channel, but it will have different chemical, thermal, and biological signatures than it did when it left the channel. My sense is that some hydrologists would consider this exchanging surface water to be groundwater as soon as it leaves the channel. Is it possible to differentiate groundwaters or define a threshold of residence time in the subsurface that qualifies exchanging surface water to be surface water in the subsurface, and ***not*** groundwater?

Dr. Judson Harvey

Jud Harvey, USGS, Comments on EPA Proposed Definition of "Waters of the United States"

1. Suggest clarifying in the proposed technical definition of a tributary that a tributary may have perennial, intermittent, or ephemeral flow and still be jurisdictional as long as if meets the stated criteria of having definable bed and banks and evidence of a high water mark.

2. Suggest clarifying the relation between the proposed technical definition of wetlands "adjacent" to navigable waters and the term "floodplain wetlands" used in the SAB technical review document. Using "adjacency" as a criterion has the advantage of identifying wetlands that EPA clearly means to be jurisdictional (e.g. wetland located directly upstream of a tributary channel head) that are not necessarily identified as "floodplain" wetlands using the stated definition of floodplain. However, using adjacency as a criterion has the disadvantage that it offers little useful guidance for defining the outer boundaries of adjacency, which often, seems to be well described by floodplain extent.

3. Suggest clarifying in the proposed technical definition the possible relation between ephemeral tributaries, which are proposed to be jurisdictional, and natural swales, which are not jurisdictional unless they meet the strict definition of a wetland and the test of significant nexus. Natural swales often are located directly upstream of tributary channel heads and become saturated and generate overland flow that creates flow in tributaries and perennial streams, rivers, and downstream waters. These swales are known in the literature and described in the SAB technical review document as "variable contributing areas". On page 22219 EPA asks for guidance on the possible jurisdictional nature of such swales.

4. Suggest clarifying in the proposed definition why manmade ditches must have to have perennial flow to be jurisdictional whereas tributaries only must have ephemeral flow. On page 2203 the EPA seeks guidance on the appropriate flow requirements for a ditch located wholly in uplands to be jurisdictional. In particular it would appear that ditches with intermittent flow would supply considerable water, sediment, nutrients, metals such as zinc from tire wear, etc. to downstream waters and there would appear to be no reason such features sould not be considered jurisdictional

Dr. Michael Josselyn

SAB Connectivity Panel
Comments on Adequacy of the Science to Support Proposed Rule
Dr. Michael Josselyn
August 13, 2014

My preliminary comments relating to the charge questions focus in three main areas: (1) definitions used in the proposed rule differ from those used in the Draft Science Report and could lead to differences in the interpretation of the science as it relates to the proposed legal definitions; (2) the concept of connection versus the degree of connectivity (e.g. gradient) and its relevance to a determination of significant effect on "navigable waters" needs to be clarified; and (3) the concept of aggregation of similarly situated waters and wetlands needs further analysis in order to inform a Final Rule.

Proposed definition of "waters of the US" to include all tributaries

Definitions

Under the proposed rule, all tributaries of navigable waters would be included as "waters of the United States" and subject to regulation based on their effects on navigable waters. It is important to note that the Draft Science Report utilizes a different definition of tributaries (e.g. streams and rivers) that relies on the presence of flowing water (of varying volume) whereas the Proposed Rule includes any feature that possesses certain indicators of an 'ordinary high water mark'. The indicators used by the Corps and EPA to determine the 'ordinary high water' mark (e.g. natural line on the shore, matted vegetation, sediment sorting) can be observed in very small drainages that are not usually considered in the scientific studies that deal with headwater streams. The Draft Science Report cites a number of studies that focus on headwater streams, but usually within the third or fourth order, not the first or second that would be covered by the Proposed Rule definition. As a result, the regulatory definition may extend further inland where connectivity has not been as well studied or documented. As we know from public comments, the inland extent of federal jurisdiction is a significant concern and the functions associated with these initial drainages are based on scientific information from larger, higher order features. These low order features may have flow for only a few hours or days following storm events and are the most likely candidates for being on the low end of the gradient where effects on downstream systems are lowest or minimal. Because of the importance of the issue on the extent of federal jurisdiction in these headwaters, the science needs to be more substantial than currently demonstrated in the Draft Science Report. The uncertainty and limits of the scientific knowledge should be discussed related to these features in the Science Report and where information is lacking, it should acknowledged.

Term	Draft Science Report	Proposed Rule
Tributary	"a stream or river that flows into a higher order stream or river"	"a water physically characterized by the presence of a bed and banks and ordinary high water mark, as defined at 33

Term	Draft Science Report	Proposed Rule
		CFR 328.3(e), which contributes flow, either directly or through another water, to a water identified in paragraphs (1)(i) through (iv) of this definition. In addition, wetlands, lakes, and ponds are tributaries (even if they lack a bed and banks or ordinary high water mark) if they contribute flow, either directly or through another water to a water identified in paragraphs (1)(i) through (iii) of this definition. A water that otherwise qualifies as a tributary under this definition does not lose its status as a tributary if, for any length, there are one or more 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 of the break. A tributary, including wetlands, can be a natural, man-altered, or man-made water and includes waters such as rivers, streams, lakes, ponds, impoundments, canals, and ditches not excluded in paragraph (2)(iii) or (iv) of this definition."
River	"A relatively large volume of flowing water within a visible channel, including subsurface water moving in the same direction as the surface water, and lateral flows exchanged with associated floodplain and riparian areas."	Not defined. However, it is stated that tributaries include rivers and that some rivers are considered "navigable waters".
Stream	"A relatively small volume of flowing water within a visible channel, including subsurface water moving in the same direction as the surface water, and lateral flows with associated floodplain and riparian areas."	Not defined.

The tributary definition in the Proposed Rule also includes other features such as flood control channels, some ditches, underground stormwater drainage works that are not part of, nor discussed in, the Draft Science Report. Presumably such man-made features may alter the functions associated with the tributary or alter the water quality considerably—either beneficially (sediment deposition in reservoirs) or adversely (addition of urban storm water). The Draft Science Report focused on research from natural systems and therefore does not provide sufficient information on which to discuss the role of these man-made features. The Panel recommended that more information be provided in the Science Report on the effect of man-made features on connectivity—either elimination or enhancement of connectivity. In urban environments where water flows are largely in man-made structures, this information will be necessary to support the conclusion that impacts to upstream features not part of the urban infrastructure would have a significant impact on navigable waters, when in fact the urban infrastructure itself is the cause of the impact to water quality.

Connectivity Gradient

Both the Draft Science Report and the Proposed Rule state that "connectivity is the degree to which components of a system are joined, or connected, by various transport mechanisms and is determined by the characteristics of both the physical landscape and the biota of the specific system". The Panel took considerable time to address this issue and acknowledged that for tributary systems there is strong evidence for a high degree of connectivity; however, also recognized that there is a gradient for streams based on frequency, magnitude, and duration of flows. As stated above, the extent of the federal jurisdiction under the Proposal Rule would be based on indicators that can be observed in very small features that may flow for only a few hours or days following a rain event. The Draft Science Report acknowledged that most databases and maps do not portray these features (Page 4-2 lines 32-36). While they comprise a significant percentage of total stream length, the primary differences are that they exhibit very low durations of flow and the frequency between flow events, especially in the arid west, may be measured in years. As a result, while no one would argue that they are not connected via water flow at some time, their function and role in biological integrity of navigable waters should be considered on a gradient.

The Draft Science report found only two studies that included first order streams in their analysis. One composite analysis that reviewed a number of studies found that nitrogen nutrient cycling increased with stream order (Ensign and Doye 2006). Another study on fish diversity (Harrel et al. 1967) showed a direct correlation between higher stream order and fish diversity. Obviously, the presence of microbiota involved in nutrient transformation and occurrence of fish would be directly related to the duration and frequency of flow as would other ecological functions within these very low order drainages. Most of the other studies cited in the Draft Science Report dealt with higher order streams and it is assumed that the processes occurring in these systems also apply to the low (1st and 2nd) order streams.

Based on the limited studies available, the conclusion to be reached from the Draft Science Report is that a gradient does apply to the types of features that would be regulated under the Proposed Rule and an assessment of a significant nexus should apply to such features as opposed to being assumed.

Aggregation

The Proposed Rule states that "the agencies conclude that tributaries, including headwaters, intermittent, and ephemeral streams, and especially when all tributaries in a watershed are considered in combination, have a significant nexus to traditional navigable waters….and when considered at a watershed scale, the scientific evidence supports a legal determination that they meet the "significant nexus" standard". The Proposed Rule contains no definition of watershed, but does discuss the term "region" as the basis upon which to base the aggregation of similarly situated waters and define the "region" as the watershed of the nearest navigable water. Obviously, this could be a very large area that may drain significant portions of a single State[1]. It would be hard to argue that including all the streams within such a large area in one grouping would not have an effect on the downstream water.

[1] The Proposed Rule also states that in the Arid West it may use a 10 digit hydrologic unit code watershed to deal with especially large watersheds; however, this issue may extend to other parts of the US.

The Draft Science Report states that the "watershed scale is the appropriate context for interpreting technical evidence about individual watershed components" (Page 3-1) and defines a watershed as the area drained by a stream, river, or other water body, typically divided between one water body and another". While this would include a watershed defined by the point of entry to a navigable water, most of the studies have focused on much smaller watersheds. There is considerable geologic, vegetative, and topographic variation within such a large area and the determination of what constitutes similarity among the tributaries within that region would be difficult. The Panel Report requested that the Corps and EPA "more explicitly address the cumulative effects of streams and wetlands on downstream waters and the spatial and temporal scales at which functional aggregation should be evaluated" and I recommend that this be re-emphasized in our review of the Proposed Rule.

Proposed definition of adjacent wetlands and other "waters"

Definitions

The Panel discussed the issue of the difference between the definitions of wetlands as applied in the Draft Science Report and as regulated under the Clean Water Act and recommended that the EPA consider and explain how the differences between those definitions may affect the interpretation of the science to regulated features. In particular, the wetland definition used in the Draft Science Report is much broader than the wetland definition in the Proposed Rule. It is important to note that the Proposed Rule combines both wetlands (as defined below) and "other waters" as defined by the "ordinary high water mark" as subject to the same interpretation. The Draft Science Report, on the other hand, does not demonstrate, at present, the similarity in function and role that such features have when making its case in using the Cowardin definition. It is necessary that the Draft Science Report provide more scientific documentation on the functional similarities and differences between vegetated wetlands and open waters within floodplains and, in particular, how the scientific literature addresses their role in affecting biological integrity in downstream waters.

Term	Draft Science Report	Proposed Rule
Adjacent	Not defined	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"
Wetland	An area that generally exhibits at least one of the following three attributes (Cowardin et al. 1979): (1) is inundated or saturated at a frequency sufficient to support, at least periodically, plants adapted to a wet environment, (2) contains undrained hydric soil; or (3) contains nonsoil saturated by shallow water for part of the growing season.	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.
Floodplain	A level area bordering a stream or river channel that was built by sediment deposition from the stream or river under present climatic conditions and is inundated during moderate to high flow events. Floodplains formed under historic or	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 and high water flows. In Preamble, it states that the agencies will use "best professional judgment" to

Term	Draft Science Report	Proposed Rule
	prehistoric climatic conditions can be abandoned by rivers and form terraces.	determine which flood interval to use (for example 10 to 20 year flood interval zone).
Riparian	Transition areas or zones between terrestrial and aquatic ecosystems that are distinguished by gradients in biophysical conditions, ecological processes, and biota. They are areas which surface and subsurface hydrology connect water bodies with their adjacent uplands. They include those portions of terrestrial ecosystems that significant influence exchanges of energy and matter with aquatic ecosystems.	An area bordering a water where surface or subsurface hydrology directly 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 these ecosystems.

Connectivity

By definition, all wetlands within the floodplain would be considered jurisdictional under the Proposed Rule. However, there is ambiguity in the definition of floodplain within the Draft Science Report and the Proposed Rule—both of which state that it is an area of sediment deposition and subject to flooding during moderate to high flood events. However, at present, there is no definition of what that flooding frequency means except the brief statement in the Proposed Rule that the agencies will use Best Professional Judgment and generally use something between a 10 and 20 year flood event. In another section, the Proposed Rule also states 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." Thus, there is considerable confusion over what the Proposed Rule is stating would be included within the category of floodplain wetlands subject to jurisdiction.

This is an area where science could address what is an appropriate degree of connectivity between floodplain wetlands and downstream waters. As the Panel has stated, over long time frames, everything is connected; however, the question for regulators is more limited and focuses on the measureable effects on biological integrity of downstream waters. Flooding frequency is a statistical analysis and should be easily equated to such effects and where the science is available, should be evaluated in the Final Science Report. Otherwise, there will be considerable confusion and uncertainty under the guidance currently contained in the Proposed Rule.

Aggregation

Because all wetlands within floodplains are considered jurisdictional under the Proposed Rule, an analysis of similarly situated wetlands is not required. The change that is proposed is to define "neighboring" such that it would include wetlands with a confined surface water connection or a shallow groundwater connection within the definition of adjacent. The Proposed Rule is requesting further clarification as to what types of connections would suffice to make a determination that the wetland was adjacent to a regulated tributary. The Panel's recommended Conceptual Framework could assist in this determination; however, it does not specifically address the temporal or spatial issues necessary to determine whether the wetland (or "other water") has a significant effect on biological integrity of navigable waters downstream. For example, a groundwater connection may be the result of a very slow infiltration rate and not have any immediate effects to the adjacent tributary. This is an

area where science can provide some guidance; however, it may also be an area of uncertainty that the Draft Science Report should recognize.

Proposed rule related to wetlands and "waters" related to case specific analysis

Definitions

The Panel Report found that non-floodplain wetlands can have an effect on the biological integrity of downstream waters as shown in the scientific literature; however, the degree of that effect will vary on numerous factors and should be viewed on a gradient. The Proposed Rule requires a case-by-case analysis for these types of wetlands and proposes a definition for a determination of a significant nexus. The elements included in a significant nexus determination are from the Supreme Court decision and is not necessarily a hypothesis that has been tested in the scientific literature.

Term	Draft Science Report	Proposed Rule
Significant Nexus	Not defined; not considered a scientific term	A water, including wetlands, either alone or in combination with other similarily situated waters in the region (i.e. the watershed that drains to the nearest water identified in paragraphs (1)(i) through (iii) of this definition significantly affects the chemical, physical, or biological integrity of the water. For an effect to be significant, it must be more than speculative or insubstantial. Other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficient close together or sufficiently 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 the definition.

Connectivity

The Proposed Rule states that a variety of functions would need to be evaluated, including "sediment trapping, nutrient cycling, pollutant trapping and filtering, retention or attenuation of flood flows, runoff storage, export of organic matter, export of food resources, and provision of aquatic habitat". The Proposed Rule presents a number of lines of evidence that can be used to assess such a connection. However, the Proposed Rule focuses on finding evidence of a connection; not evidence that such a connection actually plays a role in affecting the biological integrity of the navigable water in question. The agencies indicate that they are seeking additional information on how to make these judgments especially on how the analysis can be more than just speculative or insubstantial. A section may need to be added to the Final Science Report that addresses what type of connections should be evaluated and the methods by which these connections can be measured. The vagueness of the term "insubstantial" is more difficult to address in the Final Science Report but is an important question that will require quantification on a case-by-case basis. Any methods, models, or techniques that have been published in the literature on this topic should be included in the Report.

Aggregation

The Proposed Rule acknowledges that there are many issues that have not been resolved by the Draft Science Report on how similarly situated wetlands may be addressed and proposes a number of ways to either classify wetlands into various types or to use ecoregions. These aggregations have the advantage of being simple to apply by regulators; however, they are likely not entirely valid from a scientific standpoint. The Panel's recommended Conceptual Model can be very useful in this type of analysis and I suggest that the members most familiar with its uses consider how it might be applied to this particular problem.

Proposed definitions and exclusions

The proposed exclusions are largely androgenic features which are not addressed by the Draft Science Report. It is not clear, except by precedent, why other features are not also excluded such as stormwater quality basins, bioswales, detention basins, industrial water processing and/or treatment facilities, desalination brine storage basins, cooling systems, oil and gas tank basins, fish farms, rice paddies, and the like. It seems that such facilities, even though water is present, would deserve similar exclusions due to their specific use for water treatment or their isolation from navigable waters. The Panel recommended that the Draft Science Report discuss how human alterations may affect connectivity—either by promoting connectivity or further isolating tributaries and wetlands from downstream navigable waters. However, the Science Report might also discuss how some man-made features are designed to avoid connectivity in order to protect the environment from toxic or polluted water sources that are present in some of these features. The construction of any facility designed to retain, store, pond, treat, or process water used in industrial processes and to assure that such liquids do not enter the environment should be excluded from jurisdiction as a matter of rule.

The exclusion for ditches seems quite narrow. If it is meant to exclude roadside ditches, for example, the ditch must be entirely constructed in uplands and drain only uplands. This could mean that a highway drainage ditch, even though constructed mostly through wetlands, but perhaps impacting wetlands or streams along 1-2% of its length would then be considered a "water of the US". The Draft Science Report did not address this issue as it focused on natural streams and wetlands. Ditches, especially vegetated ditches, can have functions similar to wetlands. Yet to regulate such features would place a considerable burden on public and private landowners and, in some cases, on public safety where these ditches are needed to drain floodwaters. This is an issue that is a matter of policy and not of science.

Other comments/issues

The Panel's recommended Conceptual Model includes surface and groundwater flows as a means to consider connectivity. The Proposed Rule also uses shallow groundwater flow as a means to address jurisdiction under the Clean Water Act, especially between wetland features. The Final Science Report should more fully address differences between shallow groundwater connections and deep groundwater connections and the differences to be expected in terms of each type of connections effect on downstream navigable waters.

Dr. Kenneth Kolm

Comments Regarding the Adequacy of the Scientific and Technical Basis of the Proposed Rule Titled Definition of Waters of the United States Under the Clean Water Act (79FR 22188-22274)

Submitted on August 13, 2014

I have thoroughly and critically read the Rule and attached documentation, and have noted the text that needs addressing. In order to coordinate the SAB's efforts with the suggested changes to the Rule, i have cross referenced the original EPA Draft Report comments and the current (7-7-14) Draft Report comments with the suggested changes. The comments may appear repetitious, but the appropriate comments will be best determined during the teleconferences.

The broader request make in the Rule is made on Page 22198:

" In addition to the proposed ‘‘other waters’’ approach in this rule, the agencies are requesting comment on a range of alternate approaches to inform their decision on how best to address ‘‘other waters.’’ The agencies will consider the full administrative record, including comments requested and received, and the final Report, as revised in response to the SAB review, when developing the final rule, and may adopt one of the alternative approaches or combination of approaches and the proposal."

This is more difficult to address since these approaches are usually not found in the "refereed literature" due to being too "applied" or not fitting the format of "single-variable" research that is more favored. However, there are approaches that are exactly what the agency is requesting and these approaches with case histories are written up in various Proceedings at State of the Art Meetings. i could provide a listing of these references if the SAB thinks this would help the Rule and Agency. The basis of these approaches are referenced:

"These elements, in context with the HLRs and Ecoregions, can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998)."

The mult-temporal and multi-scale approach is called Hydrologic and Environmental Systems Analysis (HESA) for holistic Conceptual Site Model development, and has been applied to mine and resource development and mined-land restoration, municipal management of groundwater system supply and pollution, watershed and site-scale pollution prevention and Superfund cleanup, and water rights and water quality expert witness and litigation support. The most high profile case history written up in the literature is based on an NSF long term study where the paleohydrologic system of the Anasazi living in the Four Corners Region of the Colorado Plateau was assessed in the context of societal collapse:

Kolm, K.E. and S.M. Smith. 2012. Chapter 5. Modeling Paleohydrological System Structure and Function. In Emergence and Collapse of Early Villages: Models of Central Mesa Verde Archaeology. Edited by T.A. Kohler and M.D. Varien, University of California Press; Los Angeles, CA., pp. 73-83.

Essentially, the collapse of the Ancient One's society was hypothesized to be the connectivity of the surface water and ground water systems and the relation to climate change (drought) and land use. Using HESA and Mathematical modeling, the connectivity of the surface water and ground water systems was established and quantified. However, the hypothesized collapse of the society based on water resources was found to not be true.

HESA is exactly what the agency is calling for in the Rule to determine connectivity or nexus, however, the refereed book that documents the approach is not yet completed for publication.

Questions

1. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment. This definition is based on the conclusion that a significant nexus exists between tributaries (as defined in the proposed rule) and the traditional navigable waters, interstate waters, and the territorial seas into which they flow. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (*lead discussants are: Drs. Emma Rosi-Marshall and Jennifer Tank*)

Page 22205:

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.

In the arid and semi-arid lands, this statement is not necessarily true, and groundwater is the dominant source of flow to both tributaries and the main stem river segments. For example, various gaining reaches of the Meadow Creek Wash (Nevada, Las Vegas region, Basin and Range Province) and the Virgin River (Utah, Zion National Park and St. George region, Colorado Plateau Province) sustain the middle and lower reaches of their watersheds. In some volcanic and karst regions, springs and gaining streams are the dominant source of flow for both tributary and main stem river segments. For example, the middle section of the Snake River including the Twin Falls and Boise, Idaho region of the Snake River Plain Province is mostly sustained by groundwater, and various sections of the Green River in Kentucky are sustained in the Karst region near Mammoth Cave National Park. Vast sections of the Rio Grande River and its tributaries in southern Colorado through central New Mexico (Taos, Santa Fe, and Albuquerque) are sustained mostly by groundwater.

In general, the role of regional groundwater systems is not addressed by this Rule and leaves the waters of the US vulnerable. The Rule focuses primarily on the site and subregional scales, perhaps due to the legal aspects. This tends to either ignore or at least downplay the potential significance of regional-scale hydrologic connectivity, especially as it relates to ground water. This is a problem because regional ground water flows commonly interact with the surface environment at sinks and springs. For example, the Floridan aquifer underlies all of Florida as well as portions of Mississippi, Alabama, Georgia, and South Carolina and commonly interacts with the surface environment through sinks, springs, and outcrops (see Sun et al. 1997 and references therein). To provide a better understanding of ground water connectivity, and the way that ground water connectivity might vary spatially, the SAB recommends that the EPA also

consider using the ASTM D5979-96 *Standard Guide for Conceptualization and Characterization of Ground Water Systems* (ASTM 1996; Kolm et al. 1996). To better characterize regional-scale ground water connectivity, the SAB recommends that the EPA also consider using findings from the U.S. Geological Survey Regional Aquifer Systems Analysis (RASA) Program. An understanding of regional ground water flow systems is critical to the understanding of four-dimensional hydrologic connectivity on both the local and regional scales. Understanding ground water flow in unique hydrogeologic settings, including the Floridan aquifer system (karst systems), the High Plains aquifer system (semi-arid systems), and the Snake River Plain and Rio Grande Rift aquifer systems (volcanic bedrock systems), is especially important. These and other unique hydrogeological settings are covered by the RASA Program (Sun et al. 1997).

Page 22206:

The agencies are seeking comment on whether it would provide greater regulatory clarity to exclude such wetlands from the definition of ‘‘tributary’’ because they generally lack a defined bed, bank and OHWM.

Wetlands in this landscape are a continuum with the tributary and\or main stem stream, and should NOT be excluded in this context, particularly if the main weg or flowpath is directly through the wetland from one upstream channel to a downstream channel. This goes along with the SAB flowpath concept: “The definition of connectivity in the Report should be extended to the entire landscape through a broad vision of local- to landscape-scale physical, chemical, and biological exchanges.”

2. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to traditional navigable water, interstate water, the territorial seas, impoundment, or tributary. This definition is based on the conclusion that a significant nexus exists between adjacent water bodies (as defined in the proposed rule) and traditional navigable waters, interstate waters, and the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (*lead discussants are: Drs. Siobhan Fennessy and Mazeika Sullivan*)

Page 22203:

An alternate approach would be to clarify that wetlands that connect tributary segments are adjacent wetlands, and as such are jurisdictional waters of the United States under (a)(6). In this approach, a tributary would be defined as having a bed and bank and OHWM, and the upper limit of the tributary would be defined by the point where these features cease to be identifiable. (Note that natural or manmade breaks would still not sever jurisdiction if a tributary segment with a bed and bank and OHWM could be identified upstream of the break.) Wetlands would not be considered tributaries, but would remain jurisdictional as adjacent waters. Wetlands that contribute flow, for example at the upper reaches of the tributary system, would be considered adjacent waters.

This approach would work as well as the straight tributary approach and would split off the geomorphic bed, bank, OHWM measurement scheme to a flowpath analysis scheme. If this adds

these wetlands to the jurisdiction, this would be adequate for legal purposes. To clarify the connectivity of wetlands to "waters of the US", the SAB recommends that a conceptual framework be established expressed as continuous hydrological (surface and subsurface), chemical, and biological flowpaths connecting watersheds from top to bottom, and therefore connecting waters and wetlands to downgradient waters. The flowpath framework should highlight the four-dimensional nature of connectivity, because four-dimensional connectivity scaled in a habitat-to-catchment context is a foundational aspect of freshwater ecology (e.g., Ward 1989). The flux and transformation of water, materials, and organisms – which fundamentally control the integrity of downgradient freshwater ecosystems – occur at varying rates primarily determined by climate, geology, topographic relief, and biology and are expressed in terms of surface water and ground water storage and flow through the landscape (e.g., uplands, wetlands, lakes, rivers, and floodplains). Therefore, these flowpaths are inherently four-dimensional (i.e., longitudinal, lateral, vertical, and through time).

Page 22207:

Waters, including wetlands, determined to have a shallow subsurface hydrologic connection or confined surface hydrologic connection to an (a)(1) through (a)(5) water would also be ''waters of the United States'' by rule as adjacent waters falling within the definition of ''neighboring.''

This should be added to the adjacent waters ruling. However, why just "shallow subsurface hydrologic connection"? Why not deep connections as well? "Deep" could include bedrock or unconsolidated groundwater systems, and should include shallow, subregional, and regional systems if these waters proved critical to maintaining the integrity of the "waters of the United States". Examples of this type of adjacent waters ruling should include the case histories of the arid and semi-arid western US systems, and the Karst, Fractured Rock, Sedimentary Rock, and Volcanic bedrock systems well studied across the US. Is interflow determined to be part of this process? Interflow is definitely a process for connectivity.

In general, the role of regional groundwater systems in neighboring systems is not addressed by this Rule and leaves the waters of the US vulnerable. The Rule focuses primarily on the site and subregional scales, perhaps due to the legal aspects. This tends to either ignore or at least downplay the potential significance of regional-scale hydrologic connectivity, especially as it relates to ground water in adjacent and /or neighboring systems. This is a problem because regional ground water flows commonly interact with the surface environment at sinks and springs. For example, the Floridan aquifer underlies all of Florida as well as portions of Mississippi, Alabama, Georgia, and South Carolina and commonly interacts with the surface environment through sinks, springs, and outcrops (see Sun et al. 1997 and references therein). To provide a better understanding of ground water connectivity, and the way that ground water connectivity might vary spatially, the SAB recommends that the EPA also consider using the ASTM D5979-96 *Standard Guide for Conceptualization and Characterization of Ground Water Systems* (ASTM 1996; Kolm et al. 1996). To better characterize regional-scale ground water connectivity, the SAB recommends that the EPA also consider using findings from the U.S. Geological Survey Regional Aquifer Systems Analysis (RASA) Program. An understanding of regional ground water flow systems is critical to the understanding of four-dimensional hydrologic connectivity on both the local and regional scales. Understanding ground water flow

in unique hydrogeologic settings, including the Floridan aquifer system (karst systems), the High Plains aquifer system (semi-arid systems), and the Snake River Plain and Rio Grande Rift aquifer systems (volcanic bedrock systems), is especially important. These and other unique hydrogeological settings are covered by the RASA Program (Sun et al. 1997).

To clarify the connectivity of adjacent waters to "waters of the US", the SAB recommends that a conceptual framework be established expressed as continuous hydrological (surface and subsurface), chemical, and biological flowpaths connecting watersheds from top to bottom, and therefore connecting waters and wetlands to downgradient waters. The flowpath framework should highlight the four-dimensional nature of connectivity, because four-dimensional connectivity scaled in a habitat-to-catchment context is a foundational aspect of freshwater ecology (e.g., Ward 1989). The flux and transformation of water, materials, and organisms – which fundamentally control the integrity of downgradient freshwater ecosystems – occur at varying rates primarily determined by climate, geology, topographic relief, and biology and are expressed in terms of surface water and ground water storage and flow through the landscape (e.g., uplands, wetlands, lakes, rivers, and floodplains). Therefore, these flowpaths are inherently four-dimensional (i.e., longitudinal, lateral, vertical, and through time).

Ground water connectivity, in particular, could be better represented in the Rule. The U.S. Geological Survey (USGS) has published numerous reports and learning tools on ground water connectivity, including examples of flowpath frameworks expressed in block diagrams (Heath 1983, 1984; Winter et al. 1998), that contain flows through floodplains. Care should be taken not to imply that bedrock is impermeable because ground water flows through bedrock are important flowpaths that connect hydrologic landscapes over long distances and often across watershed boundaries (e.g., Roses et al. 1996).

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In circumstances where a particular water body is outside of the floodplain and riparian area of a tributary, but is connected by a shallow subsurface hydrologic connection or confined surface hydrologic connection with such tributary, the agencies will also assess the distance between the water body and tributary in determining whether or not the water body is adjacent. ''Adjacent'' as defined in the agencies' regulations has always included an element of reasonable proximity.

Distance to water body frequently is not the story. Regarding groundwater connectivity, the hydrogeologic framework and properties (thickness, continuity, for example), including hydraulic conductivity and storativity/storage; and the subsurface source, pathway, and discharge region are important for relevance in protecting "waters of the US". We need to know the hydrogeologic framework and groundwater flow system for connectivity. Is interflow determined to be part of this process? Interflow is definitely a process for connectivity. The U.S. Geological Survey (USGS) has published numerous reports and learning tools on ground water connectivity, including examples of flowpath frameworks expressed in block diagrams (Heath 1983, 1984; Winter et al. 1998), that contain flows through floodplains. Care should be taken not to imply that bedrock is impermeable because ground water flows through bedrock are important flowpaths that connect hydrologic landscapes over long distances and often across watershed boundaries (e.g., Roses et al. 1996).

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Therefore, the determination of whether a particular water meets the definition of ''neighboring'' because the water is connected by a shallow subsurface or confined surface hydrologic connection is made in the context of the terms ''neighboring'' and ''adjacent'' as used in the regulation.

Why just shallow subsurface? Is this groundwater or interflow or both? Distance to water body frequently is not the story. Regarding groundwater connectivity, the hydrogeologic framework and properties (thickness, continuity, for example), including hydraulic conductivity and

storativity/storage; and the subsurface source, pathway, and discharge region are important for relevance in protecting "waters of the US". Need to know the hydrogeologic framework and groundwater flow system for connectivity. Is interflow determined to be part of this process? Interflow is definitely a process for connectivity. The U.S. Geological Survey (USGS) has published numerous reports and learning tools on ground water connectivity, including examples of flowpath frameworks expressed in block diagrams (Heath 1983, 1984; Winter et al. 1998), that contain flows through floodplains. Care should be taken not to imply that bedrock is impermeable because ground water flows through bedrock are important flowpaths that connect hydrologic landscapes over long distances and often across watershed boundaries (e.g., Roses et al. 1996).

To clarify the connectivity of neighboring waters to "waters of the US", the SAB recommends that a conceptual framework be established expressed as continuous hydrological (surface and subsurface), chemical, and biological flowpaths connecting watersheds from top to bottom, and therefore connecting waters and wetlands to downgradient waters. The flowpath framework should highlight the four-dimensional nature of connectivity, because four-dimensional connectivity scaled in a habitat-to-catchment context is a foundational aspect of freshwater ecology (e.g., Ward 1989). The flux and transformation of water, materials, and organisms – which fundamentally control the integrity of downgradient freshwater ecosystems – occur at varying rates primarily determined by climate, geology, topographic relief, and biology and are expressed in terms of surface water and ground water storage and flow through the landscape (e.g., uplands, wetlands, lakes, rivers, and floodplains). Therefore, these flowpaths are inherently four-dimensional (i.e., longitudinal, lateral, vertical, and through time).

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While the agencies' best professional judgment has always been a factor in determining whether a particular wetland is ''adjacent'' under the existing definition, the agencies recognize that this may result in some uncertainty as to whether a particular water connected through confined surface or shallow subsurface hydrology is an ''adjacent'' water. The agencies therefore request comment on whether there are other reasonable options for providing clarity for jurisdiction over waters with these types of connections.

Regarding shallow subsurface hydrology of an "adjacent water', the U.S. Geological Survey (USGS) has published numerous reports and learning tools on ground water connectivity, including examples of flowpath frameworks expressed in block diagrams (Heath 1983, 1984; Winter et al. 1998), that contain flows through floodplains. Care should be taken not to imply that bedrock is impermeable because ground water flows through bedrock are important flowpaths that connect hydrologic landscapes over long distances and often across watershed boundaries (e.g., Roses et al. 1996). Future efforts to determine whether a particular wetland is "adjacent" and to quantify connectivity can be informed by the wide variety of conceptual models and quantitative tools that have been developed to evaluate the connectivity of both surface and subsurface hydrological systems in different settings, including non-floodplain wetlands. The standard approach involves first characterizing the surface and subsurface elements of landscapes. Important elements include climate, geology, topographic relief, and the

amount, distribution and types of waters and wetlands. These elements can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998). Of course, the approach to quantifying hydrologic connectivity is not identical across systems, and careful attention must be given to identifying the most appropriate techniques (Healy et al. 2007; Bracken et al. 2013) and metrics (Ali and Roy 2010).

Other examples can be found in the literature related to water quantity and quality modeling (Appel and Reilly 1994; Sun et al. 1997; Harbaugh 2005; Parkhurst et al. 2010; Cunningham and Schalk 2011), and integrated surface water ground water modeling (Markstrom et al. 2008; Ely and Kahle 2012; Huntington and Niswonger 2012; Woolfenden and Nishikawa 2014), sediment transport modeling (Nelson et al. 2003; McDonald et al. 2005), and watershed and biological/habitat/landscape modeling (Kinzel et al. 1999; Kinzel et al. 2005; Hunt et al. 2013). Approaches have also been developed to quantify linkages due to ground water movement and storage (Heath 1983) and the effects of "flood pulses" (Kolm et al. 1998). Likewise, the role of chemical movement and storage to ground water systems in floodplains has been quantified by flow and transport modeling (Winter et al. 1998; Markstrom et al. 2008; Woolfenden and Nishikawa 2014) as well as with steady-state and transient analyses that simulate temporal changes (Appel and Reilly 1994; Winter et al. 1998; Nelson et al. 2003; Conaway and Moran 2004; Harbaugh 2005; McDonald et al. 2005; Markstrom et al. 2008; Huntington and Niswonger 2012).

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Options could include asserting jurisdiction over all waters connected through a shallow subsurface hydrologic connection or confined surface hydrologic connection regardless of distance; asserting jurisdiction over adjacent waters only if they are located in the floodplain or riparian zone of a jurisdictional water; considering only confined surface connections but not shallow subsurface connections for purposes of determining adjacency; or establishing specific geographic limits for using shallow subsurface or confined surface hydrological connections as a basis for determining adjacency, including, for example, distance limitations based on ratios compared to the bank-to-bank width of the water to which the water is adjacent. The agencies note that under the proposed rule any waters not fitting within (a)(1) through (a)(6) categories would instead be treated as ''other waters.'' Options could include asserting jurisdiction over all waters connected through a shallow subsurface hydrologic connection or confined surface hydrologic connection regardless of distance; asserting jurisdiction over adjacent waters only if they are located in the floodplain or riparian zone of a jurisdictional water; considering only confined surface connections but not shallow subsurface connections for purposes of determining adjacency; or establishing specific geographic limits for using shallow subsurface or confined surface hydrological connections as a basis for determining adjacency, including, for example, distance limitations based on ratios compared to the bank-to-bank width of the water to which the water is adjacent. The agencies note that under the proposed rule any waters not fitting within (a)(1) through (a)(6) categories would instead be treated as ''other waters.''

Regarding shallow subsurface connections, the U.S. Geological Survey (USGS) has published numerous reports and learning tools on ground water connectivity, including examples of flowpath frameworks expressed in block diagrams (Heath 1983, 1984; Winter et al. 1998), that contain flows through floodplains. Care should be taken not to imply that bedrock is impermeable because ground water flows through bedrock are important flowpaths that connect hydrologic landscapes over long distances and often across watershed boundaries (e.g., Roses et al. 1996). Future efforts to assert jurisdiction over all waters connected through a shallow subsurface hydrologic connection or confined surface hydrologic connection regardless of distance and to quantify connectivity can be informed by the wide variety of conceptual models and quantitative tools that have been developed to evaluate the connectivity of both surface and subsurface hydrological systems in different settings, including non-floodplain wetlands. The standard approach involves first characterizing the surface and subsurface elements of landscapes. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998). Of course, the approach to quantifying hydrologic connectivity is not identical across systems, and careful attention must be given to identifying the most appropriate techniques (Healy et al. 2007; Bracken et al. 2013) and metrics (Ali and Roy 2010).

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A shallow subsurface hydrologic connection is lateral water flow through a shallow subsurface layer, such as can be found, for example, in steeply sloping forested areas with shallow soils, or in soils with a restrictive layer that impedes the vertical flow of water, or in karst systems, specially karst pans. 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.’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). 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. Shallow subsurface connections may be found both within the ordinary root zone and below the ordinary root zone (below 12 inches), where other wetland delineation factors may not be present. A combination of physical factors may reflect the presence of a shallow subsurface connection, including (but not limited to) stream hydrograph (for example, when the hydrograph indicates an increase in flow in an area where no tributaries are entering the stream), soil surveys (for example, exhibiting indicators of high transmissivity over an impermeable layer), and information indicating the water table in the stream is lower than in the shallow subsurface. Shallow subsurface connections are distinct from deeper groundwater connections, which do not satisfy the requirement for adjacency, in that the former exhibit a direct connection to the water found on the surface in wetlands and open waters. Water does not have to be continuously present in the confined surface or shallow subsurface hydrologic connection and the flow between the adjacent water and the jurisdictional water may move in one or both directions. While they may provide the connection establishing jurisdiction, these shallow subsurface flows are not ‘‘waters of the United States.’’ For waters outside of the riparian area or floodplain, confined surface hydrologic connections (as described above) are the only types of surface hydrologic connections that satisfy the requirements for adjacency. Waters outside of the riparian area or floodplain that lack a shallow subsurface hydrologic connection or a confined surface hydrologic connection would be analyzed as ‘‘other waters’’ under paragraph (a)(7) of the proposed rule.

Saturated zone groundwater and interflow must be clearly defined. This definition allows for both if SHALLOW. However, as indicated with the Karst references, deep groundwater should be included as well for connectivity and include not only Karst, but certainly sedimentary systems, fractured rock systems, and volcanic systems as well. Many regional groundwater systems sustain the navigable waters and should be included. The real issue is both temporal and spatial as the SAB has clearly and thoroughly discussed. Also, magnitude issues need to be considered.

The U.S. Geological Survey (USGS) has published numerous reports and learning tools on ground water connectivity, including examples of flowpath frameworks expressed in block diagrams (Heath 1983, 1984; Winter et al. 1998), that contain flows through floodplains. Care should be taken not to imply that bedrock is impermeable because ground water flows through bedrock are important flowpaths that connect hydrologic landscapes over long distances and often across watershed boundaries (e.g., Roses et al. 1996).

There are methods for quantification regarding connectivity of these types of systems – both physical (fluids) and chemical (transport), and biological. Future efforts to assert jurisdiction over all waters connected through a shallow subsurface hydrologic connection or confined surface hydrologic connection regardless of distance and to quantify connectivity can be informed by the wide variety of conceptual models and quantitative tools that have been developed to evaluate the connectivity of both surface and subsurface hydrological systems in different settings, including non-floodplain wetlands. The standard approach involves first

characterizing the surface and subsurface elements of landscapes. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998). Of course, the approach to quantifying hydrologic connectivity is not identical across systems, and careful attention must be given to identifying the most appropriate techniques (Healy et al. 2007; Bracken et al. 2013) and metrics (Ali and Roy 2010).

Other examples can be found in the literature related to water quantity and quality modeling (Appel and Reilly 1994; Sun et al. 1997; Harbaugh 2005; Parkhurst et al. 2010; Cunningham and Schalk 2011), and integrated surface water ground water modeling (Markstrom et al. 2008; Ely and Kahle 2012; Huntington and Niswonger 2012; Woolfenden and Nishikawa 2014), sediment transport modeling (Nelson et al. 2003; McDonald et al. 2005), and watershed and biological/habitat/landscape modeling (Kinzel et al. 1999; Kinzel et al. 2005; Hunt et al. 2013). Approaches have also been developed to quantify linkages due to ground water movement and storage (Heath 1983) and the effects of "flood pulses" (Kolm et al. 1998). Likewise, the role of chemical movement and storage to ground water systems in floodplains has been quantified by flow and transport modeling (Winter et al. 1998; Markstrom et al. 2008; Woolfenden and Nishikawa 2014) as well as with steady-state and transient analyses that simulate temporal changes (Appel and Reilly 1994; Winter et al. 1998; Nelson et al. 2003; Conaway and Moran 2004; Harbaugh 2005; McDonald et al. 2005; Markstrom et al. 2008; Huntington and Niswonger 2012).

Page 22209:

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). The agencies request comment on whether the rule text should provide greater specificity with regard to how the agencies will determine if a water is located in the floodplain of a jurisdictional water.

Besides the 10 to 20- year flood interval, the major connectivity could be shallow groundwater, which may be ongoing. The flood plain can be defined geomorphically and hydrologically, via groundwater connection. If there is a "permanent" or even seasonal water table that connects the floodplain waters to the surface waters in the channels, the concept of actual flood frequency is a moot point. If the water table exists naturally for some part of the year, the systems are connected.

Page 22209:

The agencies intend to similarly interpret the new definition of ''neighboring.'' This new definition is designed to provide greater clarity by identifying specific areas and characteristics for jurisdictional adjacent waters, but the agency's request comment for additional clarification. Commenters should support where possible from scientific literature any suggestions for additional clarification of current explicit limits on adjacency, such as a specific distance or a

specific floodplain interval. The agencies seek comment on specific options for establishing additional precision in the definition of ''neighboring'' through: explicit language in the definition that waters connected by shallow subsurface hydrologic or confined surface hydrologic connections to an (a)(1) through (a)(5) water must be geographically proximate to the adjacent water; circumstances under which waters outside the floodplain or riparian zone are jurisdictional if they are reasonably proximate; support for or against placing geographic limits on what waters outside the floodplain or riparian zone are jurisdictional; determining that only waters within the floodplain, only waters within the riparian area, or only waters within the floodplain and riparian area (but not waters outside these areas with a shallow subsurface or confined surface hydrologic connection) are adjacent; identification of particular floodplain intervals within which waters would be considered adjacent; and any other scientifically valid criteria, guidelines or parameters that would increase clarity with respect to neighboring waters.

The basis should also include groundwater connectivity which may not need a frequency basis. There are methods for quantification regarding connectivity of these types of systems – both physical (fluids) and chemical (transport), and biological. Future efforts to assert jurisdiction over all waters connected through a shallow subsurface hydrologic connection or confined surface hydrologic connection regardless of distance and to quantify connectivity can be informed by the wide variety of conceptual models and quantitative tools that have been developed to evaluate the connectivity of both surface and subsurface hydrological systems in different settings, including non-floodplain wetlands. The standard approach involves first characterizing the surface and subsurface elements of landscapes. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998). Of course, the approach to quantifying hydrologic connectivity is not identical across systems, and careful attention must be given to identifying the most appropriate techniques (Healy et al. 2007; Bracken et al. 2013) and metrics (Ali and Roy 2010).

Other examples can be found in the literature related to water quantity and quality modeling (Appel and Reilly 1994; Sun et al. 1997; Harbaugh 2005; Parkhurst et al. 2010; Cunningham and Schalk 2011), and integrated surface water ground water modeling (Markstrom et al. 2008; Ely and Kahle 2012; Huntington and Niswonger 2012; Woolfenden and Nishikawa 2014), sediment transport modeling (Nelson et al. 2003; McDonald et al. 2005), and watershed and biological/habitat/landscape modeling (Kinzel et al. 1999; Kinzel et al. 2005; Hunt et al. 2013). Approaches have also been developed to quantify linkages due to ground water movement and storage (Heath 1983) and the effects of "flood pulses" (Kolm et al. 1998). Likewise, the role of chemical movement and storage to ground water systems in floodplains has been quantified by flow and transport modeling (Winter et al. 1998; Markstrom et al. 2008; Woolfenden and Nishikawa 2014) as well as with steady-state and transient analyses that simulate temporal changes (Appel and Reilly 1994; Winter et al. 1998; Nelson et al. 2003; Conaway and Moran 2004; Harbaugh 2005; McDonald et al. 2005; Markstrom et al. 2008; Huntington and Niswonger 2012).

3. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, 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 traditional navigable water, interstate water, or the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (*lead discussants are: Drs. Emily Bernhardt and Michael Gooseff*)

Page 22211:

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 United States'' 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 and are soliciting comment on establishing 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 section (b), are susceptible to a case-specific analysis of whether they alone, or in combination with other similarly situated waters, have a significant nexus to a traditional navigable water, an interstate water, or the territorial seas, and therefore are ''waters of the United States.''

This Rule is still reliant on distance and needs to be flow path oriented with spatial and temporal components! To clarify the connectivity of "other waters" to "waters of the US", the SAB recommends that a conceptual framework be established expressed as continuous hydrological (surface and subsurface), chemical, and biological flowpaths connecting watersheds from top to bottom, and therefore connecting other waters and wetlands to downgradient waters. The flowpath framework should highlight the four-dimensional nature of connectivity, because four-dimensional connectivity scaled in a habitat-to-catchment context is a foundational aspect of freshwater ecology (e.g., Ward 1989). The flux and transformation of water, materials, and organisms – which fundamentally control the integrity of downgradient freshwater ecosystems – occur at varying rates primarily determined by climate, geology, topographic relief, and biology and are expressed in terms of surface water and ground water storage and flow through the landscape (e.g., uplands, wetlands, lakes, rivers, and floodplains). Therefore, these flowpaths are inherently four-dimensional (i.e., longitudinal, lateral, vertical, and through time).

Page 22212:

The agencies also request comment and information below on how the science could support other approaches that could provide greater regulatory certainty regarding the jurisdictional status of ''other waters''

There are methods for quantification regarding connectivity of these types of systems specifically the "other waters" – both physical (fluids) and chemical (transport), and biological. Future efforts to assert jurisdiction over "other" waters connected through a shallow subsurface hydrologic connection or confined surface hydrologic connection regardless of distance and to

quantify connectivity can be informed by the wide variety of conceptual models and quantitative tools that have been developed to evaluate the connectivity of both surface and subsurface hydrological systems in different settings, including non-floodplain wetlands. The standard approach involves first characterizing the surface and subsurface elements of landscapes. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998). Of course, the approach to quantifying hydrologic connectivity is not identical across systems, and careful attention must be given to identifying the most appropriate techniques (Healy et al. 2007; Bracken et al. 2013) and metrics (Ali and Roy 2010).

Other examples can be found in the literature related to water quantity and quality modeling (Appel and Reilly 1994; Sun et al. 1997; Harbaugh 2005; Parkhurst et al. 2010; Cunningham and Schalk 2011), and integrated surface water ground water modeling (Markstrom et al. 2008; Ely and Kahle 2012; Huntington and Niswonger 2012; Woolfenden and Nishikawa 2014), sediment transport modeling (Nelson et al. 2003; McDonald et al. 2005), and watershed and biological/habitat/landscape modeling (Kinzel et al. 1999; Kinzel et al. 2005; Hunt et al. 2013). Approaches have also been developed to quantify linkages due to ground water movement and storage (Heath 1983) and the effects of “flood pulses” (Kolm et al. 1998). Likewise, the role of chemical movement and storage to ground water systems in floodplains has been quantified by flow and transport modeling (Winter et al. 1998; Markstrom et al. 2008; Woolfenden and Nishikawa 2014) as well as with steady-state and transient analyses that simulate temporal changes (Appel and Reilly 1994; Winter et al. 1998; Nelson et al. 2003; Conaway and Moran 2004; Harbaugh 2005; McDonald et al. 2005; Markstrom et al. 2008; Huntington and Niswonger 2012).

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Water sheds are used solely, the effects of regional groundwater systems or basins is ignored! Connectivity via regional groundwater systems needs to be considered! In general, the role of regional groundwater systems in neighboring systems is not addressed by this Rule and leaves the waters of the US vulnerable. The Rule focuses primarily on the site and subregional scales, and on watershed boundaries. This tends to either ignore or at least downplay the potential significance of regional-scale hydrologic connectivity, especially as it relates to ground water in adjacent and /or neighboring systems. This is a problem because regional ground water flows commonly interact with the surface environment at sinks and springs. For example, the Floridan aquifer underlies all of Florida as well as portions of Mississippi, Alabama, Georgia, and South Carolina and commonly interacts with the surface environment through sinks, springs, and outcrops (see Sun et al. 1997 and references therein). To provide a better understanding of ground water connectivity, and the way that ground water connectivity might vary spatially, the SAB recommends that the EPA also consider using the ASTM D5979-96 *Standard Guide for Conceptualization and Characterization of Ground Water Systems* (ASTM 1996; Kolm et al. 1996). To better characterize regional-scale ground water connectivity, the SAB recommends that the EPA also consider using findings from the U.S. Geological Survey Regional Aquifer

Systems Analysis (RASA) Program. An understanding of regional ground water flow systems is critical to the understanding of four-dimensional hydrologic connectivity on both the local and regional scales. Understanding ground water flow in unique hydrogeologic settings, including the Floridan aquifer system (karst systems), the High Plains aquifer system (semi-arid systems), and the Snake River Plain and Rio Grande Rift aquifer systems (volcanic bedrock systems), is especially important. These and other unique hydrogeological settings are covered by the RASA Program (Sun et al. 1997).

To clarify the connectivity of other waters to "waters of the US", the SAB recommends that a conceptual framework be established expressed as continuous hydrological (surface and subsurface), chemical, and biological flowpaths connecting watersheds from top to bottom, and therefore connecting waters and wetlands to downgradient waters. The flowpath framework should highlight the four-dimensional nature of connectivity, because four-dimensional connectivity scaled in a habitat-to-catchment context is a foundational aspect of freshwater ecology (e.g., Ward 1989). The flux and transformation of water, materials, and organisms – which fundamentally control the integrity of downgradient freshwater ecosystems – occur at varying rates primarily determined by climate, geology, topographic relief, and biology and are expressed in terms of surface water and ground water storage and flow through the landscape (e.g., uplands, wetlands, lakes, rivers, and floodplains). Therefore, these flowpaths are inherently four-dimensional (i.e., longitudinal, lateral, vertical, and through time).

Ground water connectivity, in particular, could be better represented in the Rule. The U.S. Geological Survey (USGS) has published numerous reports and learning tools on ground water connectivity, including examples of flowpath frameworks expressed in block diagrams (Heath 1983, 1984; Winter et al. 1998), that contain flows through floodplains. Care should be taken not to imply that bedrock is impermeable because ground water flows through bedrock are important flowpaths that connect hydrologic landscapes over long distances and often across watershed boundaries (e.g., Roses et al. 1996).

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In determining whether other waters are sufficiently close to each other or to a water of the United States, the agencies would also consider hydrologic connectivity to each other or a jurisdictional water.

In determining whether groups of other waters perform ''similar functions'' the agencies would also consider functions such as habitat, water storage, sediment retention, and pollution sequestration. These and other relevant considerations would be used by the agencies to document the hydrologic, geomorphic and ecological characteristics and circumstances of the water.

The agencies solicit comment regarding this approach to ''other waters,'' recognizing that a case-specific analysis of significant nexus is resource intensive for the regulating agencies and the regulated community alike. In addition, the agencies solicit comment on additional scientific research and data that might further inform decisions about ''other waters.'' In particular the

agencies solicit information about whether current scientific research and data regarding particular types of waters are sufficient to support the inclusion of subcategories of types of ''other waters,'' either alone or in combination with similarly situated waters, that can appropriately be identified as always lacking or always having a significant nexus.

The agencies acknowledge that there may be more than one way to determine which waters are jurisdictional as ''other waters.'' This proposal is for a case-specific analysis of whether ''other waters,'' including wetlands, alone, or in combination with other similarly situated waters located in the same region, have a significant nexus to a traditional navigable water, interstate water, or the territorial seas. The agencies make this proposal based on an analysis of the current state of the science available to them. In this proposal, the agencies continue to solicit additional science (peer-reviewed whenever possible) that could lead to greater clarity, certainty, and predictability of which waters are and are not within the jurisdiction of the CWA.

There are methods for quantification regarding connectivity of these types of systems specifically the "other waters" – both physical (fluids) and chemical (transport), and biological. Future efforts to assert jurisdiction over "other" waters connected through a shallow subsurface hydrologic connection or confined surface hydrologic connection regardless of distance and to quantify connectivity can be informed by the wide variety of conceptual models and quantitative tools that have been developed to evaluate the connectivity of both surface and subsurface hydrological systems in different settings, including non-floodplain wetlands. The standard approach involves first characterizing the surface and subsurface elements of landscapes. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998). Of course, the approach to quantifying hydrologic connectivity is not identical across systems, and careful attention must be given to identifying the most appropriate techniques (Healy et al. 2007; Bracken et al. 2013) and metrics (Ali and Roy 2010).

Other examples can be found in the literature related to water quantity and quality modeling (Appel and Reilly 1994; Sun et al. 1997; Harbaugh 2005; Parkhurst et al. 2010; Cunningham and Schalk 2011), and integrated surface water ground water modeling (Markstrom et al. 2008; Ely and Kahle 2012; Huntington and Niswonger 2012; Woolfenden and Nishikawa 2014), sediment transport modeling (Nelson et al. 2003; McDonald et al. 2005), and watershed and biological/habitat/landscape modeling (Kinzel et al. 1999; Kinzel et al. 2005; Hunt et al. 2013). Approaches have also been developed to quantify linkages due to ground water movement and storage (Heath 1983) and the effects of "flood pulses" (Kolm et al. 1998). Likewise, the role of chemical movement and storage to ground water systems in floodplains has been quantified by flow and transport modeling (Winter et al. 1998; Markstrom et al. 2008; Woolfenden and Nishikawa 2014) as well as with steady-state and transient analyses that simulate temporal changes (Appel and Reilly 1994; Winter et al. 1998; Nelson et al. 2003; Conaway and Moran 2004; Harbaugh 2005; McDonald et al. 2005; Markstrom et al. 2008; Huntington and Niswonger 2012).

Page 22215:

Ecoregion discussion:

In general, the role of regional groundwater systems is important for the Ecoregion discussion and approaches particularly for the potential significance of regional-scale hydrologic connectivity, especially as it relates to ground water in adjacent and /or neighboring systems. Regional ground water flows commonly interact with the surface environment at sinks and springs and control many of the ecoregion -scale structures and functions. For example, the Floridan aquifer underlies all of Florida as well as portions of Mississippi, Alabama, Georgia, and South Carolina and commonly interacts with the surface environment through sinks, springs, and outcrops (see Sun et al. 1997 and references therein). To provide a better understanding of ground water connectivity, and the way that ground water connectivity might vary spatially, the SAB recommends that the EPA also consider using the ASTM D5979-96 *Standard Guide for Conceptualization and Characterization of Ground Water Systems* (ASTM 1996; Kolm et al. 1996). To better characterize regional-scale ground water connectivity and ecoregion analysis, the SAB recommends that the EPA also consider using findings from the U.S. Geological Survey Regional Aquifer Systems Analysis (RASA) Program. An understanding of regional ground water flow systems is critical to the understanding of four-dimensional hydrologic connectivity on both the local and regional scales. Understanding ground water flow in unique hydrogeologic settings, including the Floridian aquifer system (karst systems), the High Plains aquifer system (semi-arid systems), and the Snake River Plain and Rio Grande Rift aquifer systems (volcanic bedrock systems), is especially important. These and other unique hydrogeological settings are covered by the RASA Program (Sun et al. 1997).

Page 22216:

The factors the agencies used in developing the list above are:
a. Density of ‘‘other waters’’ such that there can be periodic surface hydrologic connections among the waters, for example in West Coast vernal pools.
b. Soil permeability and surface or shallow subsurface flow such that the ‘‘other waters’’ can be considered hydrologically connected, such as many Texas coastal prairie wetlands.
c. Water chemistry which indicates that the ‘‘other waters’’ are part of the same system and influenced by the same processes.
d. Physical capacity of ‘‘other waters’’ to provide flood and sediment retention; this is a case where several small wetlands together may have a different effect than a single large wetland providing the same function, for example prairie potholes in the Missouri Coteau.
e. Co-location of waters to each other or similarly to the tributary system such that their cumulative and additive effects on pollutant removal through parallel, serial, or sequential processing are apparent, such as the role of pocosins in maintaining water quality in estuaries.
f. ‘‘Other waters’’ that are sufficiently near each other or the tributary system and thus function as an integrated habitat that can support the life cycle of a species or more broadly provide habitat to a large number of a single species.

The agencies request comment on the factors above and whether this list of factors is appropriate, and whether there are other factors that should be included or excluded from this list. Comments should address the science that supports each comment.

Factors restated from above:

There are methods for quantification regarding connectivity of these types of systems specifically the "other waters" – both physical (fluids) and chemical (transport), and biological. Future efforts to assert jurisdiction over "other" waters connected through a shallow subsurface hydrologic connection or confined surface hydrologic connection regardless of distance and to quantify connectivity can be informed by the wide variety of conceptual models and quantitative tools that have been developed to evaluate the connectivity of both surface and subsurface hydrological systems in different settings, including non-floodplain wetlands. The standard approach involves first characterizing the surface and subsurface elements of landscapes. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998). Of course, the approach to quantifying hydrologic connectivity is not identical across systems, and careful attention must be given to identifying the most appropriate techniques (Healy et al. 2007; Bracken et al. 2013) and metrics (Ali and Roy 2010).

Other examples can be found in the literature related to water quantity and quality modeling (Appel and Reilly 1994; Sun et al. 1997; Harbaugh 2005; Parkhurst et al. 2010; Cunningham and Schalk 2011), and integrated surface water ground water modeling (Markstrom et al. 2008; Ely and Kahle 2012; Huntington and Niswonger 2012; Woolfenden and Nishikawa 2014), sediment transport modeling (Nelson et al. 2003; McDonald et al. 2005), and watershed and biological/habitat/landscape modeling (Kinzel et al. 1999; Kinzel et al. 2005; Hunt et al. 2013). Approaches have also been developed to quantify linkages due to ground water movement and storage (Heath 1983) and the effects of "flood pulses" (Kolm et al. 1998). Likewise, the role of chemical movement and storage to ground water systems in floodplains has been quantified by flow and transport modeling (Winter et al. 1998; Markstrom et al. 2008; Woolfenden and Nishikawa 2014) as well as with steady-state and transient analyses that simulate temporal changes (Appel and Reilly 1994; Winter et al. 1998; Nelson et al. 2003; Conaway and Moran 2004; Harbaugh 2005; McDonald et al. 2005; Markstrom et al. 2008; Huntington and Niswonger 2012).

Page 22216:

Discussion of Hydrologic-Landscape Regions. Then:

The agencies seek comment on the technical bases for using ecoregions and hydrologic-landscape regions under this option. Commenters may also address whether some other method or combination of methods (certain ecoregions and hydrologic-landscape regions, for example)

of mapping geographic boundaries is better supported by the science. Comments should also address whether and how this option is consistent with the science and the caselaw.

Using Hydrologic-Landscape Regions and Ecoregions as a basis for determining the connectivity of hydrologic and biologic systems to "waters of the U.S." is an excellent first step in understanding the holistic nature of these systems in any location when combined with the standard approach that involves characterizing the surface and subsurface elements of landscapes to determine flowpath networks at multiple temporal and spatial scales. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements, in context with the HLRs and Ecoregions, can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998).

Page 22217:

3. Additional ''other waters'' approaches. The agencies request comment on additional ''other waters'' approaches considered, but not proposed by the agencies.

Restated and note references: Using Hydrologic-Landscape Regions and Ecoregions as a basis for determining the connectivity of hydrologic and biologic systems to "waters of the U.S." is an excellent first step in understanding the holistic nature of these systems in any location when combined with the standard approach that involves characterizing the surface and subsurface elements of landscapes to determine flowpath networks at multiple temporal and spatial scales. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements, in context with the HLRs and Ecoregions, can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998).

4. The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions. (*lead discussants are: Drs. David Allan and Mark Rains)*

Page 22203:

The agencies specifically seek comment on the appropriate flow regime for a ditch excavated wholly in uplands and draining only uplands to be included in the exclusion of paragraph (b)(3). In particular, the agencies seek comment on whether the flow regime in such ditches should be less than intermittent flow or whether the flow regime in such ditches should be less than perennial flow as proposed.

Waters and wetlands are "connected" in the sense that they are integrated into the broader hydrological landscape and therefore can play important roles in maintaining the chemical, physical, and biological integrity of downgradient waters. They perform a variety of functions (which are broadly classified in the Report as source, sink, lag, transformation, and refuge

functions) at rates that are a characteristic of where these waters and wetlands are located on the gradient of connectivity. Therefore, downgradient waters might suffer consequences if the degree of connectivity is altered by human activities. Alterations can be of three types: some can directly decrease connectivity, such as dams (Ward and Stanford 1983) and ground water pumping that lowers local water tables and causes surface-water connections to cease (Haag and Pfeiffer 2012); some can directly increase connectivity, such as ditches (Min et al. 2010) and tile drains (Randall et al. 1997); and some can indirectly change the frequency, magnitude, timing, duration, and/or rate of change of connectivity, such as impervious surfaces in the contributing watershed (Walsh et al. 2012). Each of these types of human alterations affect connectivity and therefore can impact the chemical, physical, and biological integrity of the downgradient waters.

As surface water features, ditches and canals function as either perennial or intermittent streams or tributaries and should be legally treated as such. Regardless of source, these ditches convey or store water and chemical/physical/biological sediment and materials spatially on a temporal basis (rate, magnitude, and frequency).

The water from ditches can leak to provide groundwater recharge to the sediments or bedrock beneath the ditch, or accumulate groundwater discharge in its flow (serve as a drain) or both. These functions can be temporal (seasonal) and spatial. In all, the ditch impacts many of the hydrologic systems in the vicinity of its location, and is connected.

Land use and water rights changes affect the function of the ditch and can be critical to the "waters of the US". In the western US, land use changes are mostly from agriculture to urbanization, and the ditches are frequently "shut off" as water is passed downstream to thirsty cities, and local aquifers "dry up" since irrigation and ditch leakance is reduced. This, in turn, affects the local tributaries and springs, many of which had water rights partitioned during the agricultural times.

Page 22218:

The following features are exempt:

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, including groundwater drained through subsurface drainage systems; and
Gullies and rills and non-wetland swales.

In no cases should groundwater that is shown to be connected to "waters of the US" be exempt (see comments above). Each of these features listed may be connected to "waters of the US" depending on the hydrogeologic framework that is underneath the features, and the hydrologic

system that the features are constructed within. Artificial lakes or ponds, or reflection pools, etc., created by excavation, diking, or construction may be directly connected to the "waters of the US" by shallow or deeper groundwater, therefore, a "blanket" exemption is not recommended. Each feature should be cleared by a systematic hydrologic system analysis. These exemptions may invite multiple abuses to the Rule, particularly when land ownership and land use are changed with time.

Page 22220:

The agencies request comment on how they could provide greater clarity on how to distinguish between erosional features such as gullies, which are excluded from jurisdiction, and ephemeral tributaries, which are categorically jurisdictional.

A gully that has been allowed to become permanent and minimally ephemeral, such as gullies observed throughout the Western US caused by over grazing of livestock, should be in the jurisdiction of the waters of the US. The landowner should have a specified amount of time to correct the situation, or the conversion is permanent.

The agencies request comment on how they could provide greater clarity on how to distinguish swales, which are excluded from jurisdiction, and ephemeral tributaries, which are categorically jurisdictional.

A distinction between natural and human-made swales is necessary, and the functions of the swales should be determined on a case by case basis regarding the effects on the chemical, physical, and biological aspects of the system.

The agencies request comment on this formulation of the ditch exclusion. The agencies specifically seek comment on the appropriate flow regime for a ditch excavated wholly in uplands and draining only uplands to be covered by the exclusion in paragraph (b)(3). In particular, the agencies seek comment on whether the flow regime in such ditches should be less than intermittent flow or whether the flow regime in such ditches should be less than perennial flow as proposed.

Constructed ditches change the hydrologic flow paths of local and subregional hydrologic systems. Ditches are perennial, intermittent, or ephemeral water conveyors, and should be regulated as such. See discussion above on changing land use and ground water recharge that flows to jurisdiction waters, which is an issue in the Western US. A classic example is the gutters on houses in the Western US – water can be harmlessly deflected off the houses as long as the runoff is allowed to reach the streams via drains, sewers, etc. If individuals collect the runoff and water their gardens, it is a direct violation of water law (Milagro Bean Field War). However, our laws do not cover the increase of impermeable structures that prevent groundwater recharge where our houses are built.

5. If you have any other comments about the adequacy of the scientific and technical basis of the proposed rule, please provide them as well.

To restate, there is a tremendous understatement of the role of groundwater in connectivity particularly in the adjacent water bodies and other waters sections of the Rule, and the exemptions of the Rule; this leaves the waters of the US vulnerable. The Rule focuses primarily on the site and subregional scales, perhaps due to the legal aspects. This tends to either ignore or at least downplay the potential significance of regional-scale hydrologic connectivity, especially as it relates to ground water. This is a problem because regional ground water flows commonly interact with the surface environment at sinks and springs. For example, the Floridan aquifer underlies all of Florida as well as portions of Mississippi, Alabama, Georgia, and South Carolina and commonly interacts with the surface environment through sinks, springs, and outcrops (see Sun et al. 1997 and references therein). To provide a better understanding of ground water connectivity, and the way that ground water connectivity might vary spatially, the SAB recommends that the EPA also consider using the ASTM D5979-96 *Standard Guide for Conceptualization and Characterization of Ground Water Systems* (ASTM 1996; Kolm et al. 1996).

EPA's Proposed Rule

The following sections of the proposed rule may be most relevant for your review:

Preamble (explains the basis and purpose for the proposed rule)

The agencies acknowledge that there may be more than one way to determine which waters are jurisdictional as ''other waters.'' To best meet their goals and responsibilities, the agencies request comment on alternate approaches to determining whether ''other waters'' are similarly situated and have a ''significant nexus'' to a traditional navigable water, interstate water, or the territorial seas. In the discussion of ''other waters'' later in the preamble, the agencies seek comment on these other approaches and whether they could better meet the goals of greater predictability and consistency through increased clarity, while simultaneously fulfilling the agencies' responsibility to the CWA's objectives and policies to protect water quality, public health, and the environment.

Commenters will specifically be asked to comment on whether and how these alternate approaches may be more consistent with the goal of clarity, and the CWA, the best available science, and the caselaw. In particular, the agencies are interested in comments, scientific and technical data, caselaw, and other information that would further clarify which ''other waters'' should be considered similarly situated for purposes of a case-specific significant nexus determination. The agencies seek comment on a number of alternative approaches. These alternatives include potentially determining waters in identified ecological regions (ecoregions) or hydrologic-landscape regions are similarly situated for purposes of evaluating a significant nexus, as well as the basis for determining which ecoregions or hydrologic-landscape regions should be so identified.

Restated from above and note references: Using Hydrologic-Landscape Regions and Ecoregions as a basis for determining the connectivity of hydrologic and biologic systems to "waters of the U.S." is an excellent first step in understanding the holistic nature of these systems in any location when combined with the standard approach that involves characterizing the surface and

subsurface elements of landscapes to determine flowpath networks at multiple temporal and spatial scales. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements, in context with the HLRs and Ecoregions, can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998).

II. Background -- Page 22190

A. Executive Summary -- Page 22190

Page 22193:

Under the proposed first section of the regulation, section (a), the agencies propose to define the ''waters of the United States'' for all sections (including sections 301, 311, 401, 402, 404) of the CWA to mean:

• 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;
• All interstate waters, including interstate wetlands;
• The territorial seas;
• All impoundments of a traditional navigable water, interstate water, the territorial seas or a tributary;
• All tributaries of a traditional navigable water, interstate water, the territorial seas or impoundment;
• All waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment or tributary; and
• 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 traditional navigable water, interstate water or the territorial seas.

Nexus definition is weak on groundwater connectivity. Please see comments in previous sections. To restate, there is a tremendous understatement of the role of groundwater in connectivity particularly in the adjacent water bodies and other waters sections of the Rule, and the exemptions of the Rule; this leaves the waters of the US vulnerable. The Rule focuses primarily on the site and subregional scales, perhaps due to the legal aspects. This tends to either ignore or at least downplay the potential significance of regional-scale hydrologic connectivity, especially as it relates to ground water. This is a problem because regional ground water flows commonly interact with the surface environment at sinks and springs. For example, the Floridan aquifer underlies all of Florida as well as portions of Mississippi, Alabama, Georgia, and South Carolina and commonly interacts with the surface environment through sinks, springs, and outcrops (see Sun et al. 1997 and references therein). To provide a better understanding of ground water connectivity, and the way that ground water connectivity might vary spatially, the SAB

recommends that the EPA also consider using the ASTM D5979-96 *Standard Guide for Conceptualization and Characterization of Ground Water Systems* (ASTM 1996; Kolm et al. 1996).

Page 22194:

The proposed section (b) excludes specified waters and features from the definition of ‘‘waters of the United States.’’ Waters and features that are determined to be excluded under section (b) of the proposed rule will not be jurisdictional under any of the categories in the proposed rule under section (a), even if they would otherwise satisfy the regulatory definition. Those waters and features that would not be ‘‘waters of the United States’’ are:….. groundwater, including groundwater drained through subsurface drainage systems; and…

See comments in text above. In no cases should groundwater that is shown to be connected to “waters of the US” be exempt (see comments above). Each of the features listed in (b) may be connected to “waters of the US” depending on the hydrogeologic framework that is underneath the features, and the hydrologic system that the features are constructed within. Artificial lakes or ponds, or reflection pools, etc., created by excavation, diking, or construction may be directly connected to the “waters of the US” by shallow or deeper groundwater, therefore, a “blanket” exemption is not recommended. Each feature should be cleared by a systematic hydrologic system analysis. These exemptions invited multiple abuses to the Rule, particularly when land ownership and land use are changed with time.

Page 22195:

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.

Restated from above and note references: Using Hydrologic-Landscape Regions and Ecoregions as a basis for determining the connectivity of hydrologic and biologic systems to “waters of the U.S.” is an excellent first step in understanding the holistic nature of these systems in any location when combined with the standard approach that involves characterizing the surface and subsurface elements of landscapes to determine flowpath networks at multiple temporal and spatial scales. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements, in context with the HLRs and Ecoregions, can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998).

B. Background on Scientific Review and Significant Nexus Analysis – Page 22195

Page 22198:

In addition to the proposed ‘‘other waters’’ approach in this rule, the agencies are requesting comment on a range of alternate approaches to inform their decision on how best to address ‘‘other waters.’’ The agencies will consider the full administrative record, including comments requested and received, and the final Report, as revised in response to the SAB review, when developing the final rule, and may adopt one of the alternative approaches or combination of approaches and the proposal.

To clarify the connectivity of “other waters” to “waters of the US”, the SAB recommends that a conceptual framework be established expressed as continuous hydrological (surface and subsurface), chemical, and biological flowpaths connecting watersheds from top to bottom, and therefore connecting other waters and wetlands to downgradient waters. The flowpath framework should highlight the four-dimensional nature of connectivity, because four-dimensional connectivity scaled in a habitat-to-catchment context is a foundational aspect of freshwater ecology (e.g., Ward 1989). The flux and transformation of water, materials, and organisms – which fundamentally control the integrity of downgradient freshwater ecosystems – occur at varying rates primarily determined by climate, geology, topographic relief, and biology and are expressed in terms of surface water and ground water storage and flow through the landscape (e.g., uplands, wetlands, lakes, rivers, and floodplains). Therefore, these flowpaths are inherently four-dimensional (i.e., longitudinal, lateral, vertical, and through time).

Using Hydrologic-Landscape Regions and Ecoregions as a basis for determining the connectivity of hydrologic and biologic systems to “waters of the U.S.” is an excellent first step in understanding the holistic nature of these systems in any location when combined with the standard approach that involves characterizing the surface and subsurface elements of landscapes to determine flowpath networks at multiple temporal and spatial scales. Important elements include climate, geology, topographic relief, and the amount, distribution and types of waters and wetlands. These elements, in context with the HLRs and Ecoregions, can then be integrated to create a flowpath network that describes connectivity (Heath 1983; ASTM 1996; Kolm et al. 1996; Winter et al. 1998). This approach has been extended to biological connectivity and hydrogeomorphic (HGM) wetland classifications (e.g., Kolm et al. 1998).

III. Proposed Definition of Waters of the United States – Page 22198

Page 22199: Primary source of connectivity is groundwater, yet:

CWA Exclusions: groundwater, including groundwater drained through subsurface drainage systems.

Restated from above text: In no cases should groundwater that is shown to be connected to “waters of the US” be exempt (see comments above). Each of the features listed for exemptions to the Rule may be connected to “waters of the US” depending on the hydrogeologic framework that is underneath the features, and the hydrologic system that the features are constructed within. Artificial lakes or ponds, or reflection pools, etc., created by excavation, diking, or construction may be directly connected to the “waters of the US” by shallow or deeper groundwater, therefore, a “blanket” exemption is not recommended. Each feature should be

cleared by a systematic hydrologic system analysis. These exemptions can invite multiple abuses to the Rule, particularly when land ownership and land use are changed with time.

Appendix A. Overview of the Scientific Literature on Aquatic Resource Connectivity and Downstream Effects -- Page 22222

Comments listed above by category.

The regulatory text of the proposed rule -- Page 22262.

Comments listed above by category.

Dr. Mark Murphy

August 13, 2014

Subject: EPA Proposed Rule; Definition of ‘‘Waters of the United States’’ Under the Clean Water Act; 40 CFR Parts 110, 112, 116, et al.

I have read and considered the Proposed Rule, as requested by the Chair of the SAB. I appreciate the opportunity to represent the technical community in this extended dialogue on the matter of Clean Water Act (CWA) applicability. This is a subject that my colleagues and I have pondered for many years and we welcome EPA's attempt to provide clarity. The complexities and subtleties of how to interpret the CWA are formidable. I might add as a disclosure, that I am a strong supporter of the CWA and have seen numerous examples of its protective power. My encouragement and criticisms over the course of this process only reflect my desire to establish a solidly defensible rule that can add to this power.

In this light, I must say I am puzzled as to why EPA has decided to release the Proposed Rule before receipt of our review of the Connectivity Report (EPA 2013). While I was told at our December 2013 meeting that a draft rule was in preparation, I hardly expected that the draft would be released to the public before our review. The usual protocol in science is not to release a report before the review is complete, the purpose being to allow a frank and honest appraisal of the work before positions are 'hardened' and reputations are placed in jeopardy. The sequence employed by EPA suggests to the public that there is no critical input needed by the SAB - - just a few minor additions. If I believed this to be the case, I would be very dismayed.

In point of fact, the SAB Review suggested that some *major* additions be made to the Connectivity Report. The most fundamental conclusion of the review was that a dichotomous, binary approach to connectivity is not supported by the existing scientific literature. As was stated in the letter to the EPA Administrator,

> "The (Connectivity) Report often refers to connectivity as though it is a binary property (connected versus not connected) rather than as a gradient. In order to make the Report more technically accurate, the SAB recommends that the interpretation of connectivity be revised to reflect a gradient approach that recognizes variation in the

> frequency, duration, magnitude, predictability, and consequences of those connections." (EPA 2014)

Nature rarely gives yes or no answers. For this reason, jurisdiction by rule based upon dichotomous categories is simply not scientifically valid and appears to be based upon legal convenience. Jurisdiction by rule, as applied in the Proposed Rule, is not supported by the best available science.

The legal record also seems to support this conclusion. A gradient in connectivity is clearly directed by a common-sense reading of the Rapanos decision. The Proposed Rule states in several places that the term 'significant nexus,' used in the decision, is not a scientific term. That may be correct in the sense that the term is not found in the scientific literature; however, the phrase should be examined in the context of Justice Kennedy's next several comments,

> "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.'"
>
> Rapanos v. United States, 547 U.S. 715 (2006)

Justice Kennedy, here and elsewhere, repeatedly relates the term 'nexus' and 'significant nexus' to 'chemical, physical, and biological integrity,' which *are* scientific terms. Nexus is defined by Webster as a connection and a connection of one part of an ecosystem to the chemical, physical, and biological integrity of another ecosystem, directly requires a cause-and-effect relationship to be a *consequence*. Therefore, significant nexus, scientifically defined, clearly requires that there be a cause-and-effect, connective relationship between the water body under examination and some downstream aquatic ecosystem, 'traditionally navigable' if we continue with Justice Kennedy's opinion.

The term 'significant' still needs better clarity. Non-technical significance is a vague concept, whether legally or politically approached. It is never defined in the Proposed Rule other than to say that it's not 'speculative' or 'insubstantial.' Scientific significance is not at all vague, as any first-year grad student quickly learns. The definition of significance in science is directly dependent upon a proposed cause-and-effect hypothesis and the repeated testing of the explanatory adequacy of that hypothesis. For example, if I flip a coin, I hypothesize that it will land as either heads or tails. Repeated trials of the coin-flipping experiment show the

repeatability of the results and the adequacy of my explanation. If the coin always comes up heads or tails, then the 'always' part of the result is the 'significance' of the hypothesis, which can be quantified in many ways using statistical methodologies (Ellison 1996, Johnson 2014).

In actuality, the coin could actually land on its edge. I've never seen that happen, but it could happen. However, if the statistically based likelihood of this outcome is less than some accepted level, the hypothesis of a non-heads-or-tails outcome is called 'insignificant.' This is not the same as creating a dichotomous model of the coin flipping hypothesis; it simply states that most of the time coins come up heads or tails. Using this simple example, jurisdiction by rule is akin to saying the coin will *never* land on its edge
- - a reasonable conclusion only if we know the 'one in a million' statistical data for the coin flipping experiment. And in Nature, the experiments are almost never this simple.

In any case, if the term 'significant' has any scientific relationship to 'chemical, physical, and biological integrity' there would be a hypothetical cause for the consequential harm to that integrity. Repeatable trials (or more likely in ecology, observations) of that cause- and-effect hypothesis would demonstrate the ***scientific*** significance of its power to explain the downstream effect.

During the SAB Review, the panel was explicitly told not to discuss the definition of significance; however, the cause-and-effect based definition discussed above is clearly implied throughout. For example, in section 3.1 of the SAB Review, the authors state:

> "As noted in the many public comments to the SAB, the binary perspective in the (Connectivity) Report implies that any connectivity must *significantly affect* the biological, physical, or chemical integrity of downstream waters. Although connectivity is known to be ecologically important even at the lower end of the gradient, the frequency, duration, predictability, and magnitude of connectivity will ultimately determine the *consequences* to downstream waters." (EPA 2014)

This must be the approach used by the Proposed Rule, if it is to have a defensible basis in science. The significance of the connection must be defined by the likelihood of a measurable effect, which is controlled by the transport mechanism and pathway through the watershed.

This concept of a gradient of connectivity and downstream consequences is taken from the science of disturbance ecology (Fisher 1983, Resh et al 1988, Poff et al 1997, Stanley et al 2010), which was not characterized in the Connectivity Report and is not represented in the Proposed Rule. Given a cause in the watershed, disturbance ecology characterizes the downstream effect on the physical, chemical and biological integrity of the affected community.

These effects are scientifically related to the magnitude (the absolute or relative size of the disturbance), the duration (how long the disturbance lasts), the frequency (how often does it return) and the predictability (how regularly the disturbance returns). Effects upon the geological morphology of a stream, the watering of the riparian plant community, the life cycle of fish or invertebrates and the biodegradation of chemical pollutants can be characterized as effective or trivial based upon established dependencies between harm to physical, chemical and biological integrity of the downstream ecosystem and the values of these four data. For example, in the case of an ecological risk assessment, these metrics could define the exposure risk of a target organism to a chemical stressor (EPA 1998).

Any hypothesis of a upstream disturbance cause and downstream disintegrative effect can be tested for scientific significance using these four parameters, in addition to, or combination with, other factors specific to the target population. These four parameters establish the temporal scale of scientific significance, in this case, and it is the lack of this fundamental ecological concept that causes the Proposed Rule to be flawed.

Where the spatial scale is conflated with the temporal scale, these flaws become even more damaging. For example, on page FR22263 and subsequent pages the term ‘floodplain’ is defined as:

> “. . . 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.”
>
> - FR, vol.79, no.76, p.22263

While this definition might work for a casual description of a local stream, it is not otherwise useful. This definition would include my backyard - - far outside of the hydrologically defined floodplain of my local watercourse (Painted Hills Wash), inundated

by water as I type this because of a cloudburst. Such a definition would have no scientific utility unless there was a way to incorporate a temporal and spatial scale for the disturbing 'high water flow' that would exclude a summer thunderstorm.

The curious thing about the Proposed Rule is that the need to establish the disturbance scale and its scientific significance to downstream traditional waters *is* discussed in the section on 'adjacent' and 'other' waters. There is no scientific justification presented in the Proposed Rule to explain this abrupt shift away from the dichotomous definition of connectivity used elsewhere. For example, the preamble states:

> "Examples of confined surface water hydrologic connections that demonstrate adjacency are swales, gullies, and rills. The frequency, duration, and volume of flow associated with these confined surface 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."
>
> - FR, vol.79, no.76, p.22210

This statement admits that disturbance parameters ('frequency, duration, and volume of flow') and other spatially and temporally variable factors ('precipitation, snowmelt, landforms, soil types, and water table elevation') provide the opportunity for influence, not the simple existence of a channel (i.e., swales, gullies or rills), which in this case are exempted by rule.

Further, on page FR22214, the preamble states, in reference to 'other waters:'

> "When evaluating an ''other water'' individually or cumulatively for the presence of a significant nexus to an (a)(1) through (a)(3) water, there are a variety of factors that can be considered that will influence the chemical, physical, or biological connections the ''other water'' has with the downstream (a)(1) through (a)(3) water. The likelihood of a significant connection is greater with increasing size and decreasing distance from the identified (a)(1) through (a)(3) water, as well as with increased density of the ''other waters'' for ''other waters'' that can be considered in combination with similarly situated waters."
>
> - FR, vol.79, no.76, p.22202

The preamble then goes into specifics on the physical, chemical and biological basis for determining the 'likelihood of significant connection,' which in each case resembles a simplistic disturbance analysis conducted to ascertain the scientific significance of a cause-effect hypothesis for an aquatic ecosystem.

Such a 'likelihood of significant connection' is well understood and utilized across regulatory science, including EPA's National Center for Environmental Assessment (NCEA). NCEA is a professional leader in research on the quantitative and predictive risk-based effects of human disturbance on ecosystems. It is inconceivable that the Proposed Rule would have no input from the nearly 40 years of connective ecological risk research conducted by NCEA.

The consequences of measurable effects due to disturbance are also well researched by EPA, under the Office of Water, Water Quality Standards and Criteria program. Water quality criteria are an explicit result of measuring what constitutes a scientifically significant nexus between a surface water pathway exposure and a resident aquatic species. There is no better way of assessing the impact of a watershed connection than its potential to degrade the water quality of receiving waters or violate water quality standards for those waters. Yet no reference to either water quality standards or the science for setting them appears in the Proposed Rule.

There is no scientific justification for applying case-by-case jurisdiction to 'adjacent' and 'other' waters and not applying it to *all* potentially jurisdictional waters. The SAB review suggested that the EPA apply a pathway model to establish a scientifically significant nexus, to wit:

> "The conceptual framework in the Connectivity Report should generally express the importance of climate, geology (surface and subsurface), topographic relief, and biology on flow and transport. The resulting three-dimensional structure should show potential surface, near surface, and subsurface *pathways*, which then can be analyzed in terms of hydrological, chemical, and biological connectivity in four dimensions (i.e., with the temporal dimension included)." (EPA 2014, Italicized for emphasis)

This is the approach that has been followed by the US Army Corps of Engineers in their jurisdictional determinations for many years. It is the only way that is compatible with current scientific theory and practice.

A good example can be found in the arid Southwestern US. It is interesting that the preamble specifically mentions the Southwest, to wit:

> "Also, in many intermittent and ephemeral tributaries, including dry-land systems in the arid and semi-arid west, OHWM (ordinary high water mark) 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."
>
> - FR, vol.79, no.76, p.22202

The fact is that OHWM indicators are discontinuous because *flow paths* are discontinuous and connectivity across them can drop to a near-zero scientific significance. For example, the bed and banks of the Santa Cruz River are quite clear where Painted Hills Wash leaves my neighborhood and joins the river and there would be little difficulty in establishing that a disturbance in the wash, which flows a couple of times a year, has a scientifically significant nexus to the Santa Cruz River ecosystem. However, the river completely loses all physical, chemical and biological character about 40 miles south of the wash on the Santa Cruz Flats. According to Webb and co-workers (2014),

> "Little if any sediment entrained upstream of Marana (immediately north of Tucson) makes it through the Santa Cruz Flats to the Gila River, except during rare, large floods. Indeed, most maps do not show a channel crossing this nearly featureless plain. Most of the time, the lower Santa Cruz valley functions as a closed basin, with all the water and sediment from the Tucson Basin trapped on the alluvial plain downstream of Marana."

Given this, it is unclear, and scientifically unjustified, why the jurisdictional determination of 'adjacent and other waters' needs to consider the 'likelihood of significant connection,' yet the Santa Cruz River at Tucson is included by rule, as a tributary of the Colorado River, a traditionally navigable water of the US.

In the case of some waters (probably the vast majority of perennial, intermediate and ephemeral streams, floodplain and non-floodplain wetlands) a pathway analysis would be

simple and beyond dispute. In other cases, the results would be less clear. These other cases may be the subject of intense scientific debate. But such is science when it properly serves the public good. Case-by-case evaluation may be legally inconvenient; however Nature is rarely respectful of the Law.

1.0 SPECIFIC COMMENTS:

1.1 The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment.

As stated in my introductory comments, the inclusion by rule of all tributaries to traditional navigable waters is not scientifically justified by the published literature, the Connectivity report or the SAB review. Inclusion by rule violates the conclusion of the SAB review that connectivity exists as a gradient of causal phenomena that operate variably over flowpaths, and result in consequential disturbances in the watershed. These consequences contribute to or harm the integrity of the physical, chemical and biological functions supporting the affected ecosystem to a highly varied degree. The scientific significance of these flowpaths is a function of the disturbance scale, which can be measured in the frequency, duration, predictability, and magnitude of the disturbance. The probability of such a disturbance having a scientifically significant disintegrative effect on a downstream ecosystem creates the gradient of connectivity described in the SAB review, as currently used by the ecological sciences.

1.2 The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to a traditional navigable ater, interstate water, the territorial seas, impoundment, or tributary.

The definition of and inclusion by rule of adjacent waters also is inconsistent with the published literature, the Connectivity report or the SAB review. Once again, the concepts of 'connectivity,' 'spatial and temporal scale,' 'connective flowpaths,' 'disturbance ecology' and 'ecological function' are implicitly defined as dichotomous conditions or parameters and this violate the idea of a gradient in connectivity that is found throughout the SAB and at the heart of ecological theory and practice. The definition of significant nexus used in the Proposed Rule is scientifically flawed and does not employ modern concepts of scientific significance and statistical inference.

1.3 The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, 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 traditional navigable water, interstate water, or the territorial seas.

This part of the Proposed Rule has the closest conformity to existing scientific practice, admitting in numerous places the validity of the conclusions of the SAB review that connectivity is a gradient and not dichotomous property of a watershed and that jurisdiction by rule is not scientifically valid. The suggested defeat of EPA in addressing 'other waters' is only reasonable given that they did not take the same approach as the SAB members, namely,

> "If the goal of defining and estimating connectivity is to protect downstream waters, the interpretation must move from a dichotomous, categorical distinction (connected vs. not connected) towards a gradient approach that recognizes variation in the strength, duration and magnitude and effect of those connections. The SAB recommends that an integrated systematic approach be taken to conceptualize the structure and function of non-floodplain wetlands." (EPA 2014)

which is taken from section 3.8 addressing non-floodplain wetlands (aka 'other waters') of the SAB review. The gradient approach to connectivity is recommended twenty-eight times in the SAB review and ten times in sections 3.7 and 3.8 with regard to other waters. If an approach is used that recognizes that the temporal and spatial variation in transport properties *fundamentally* produces this gradient in connectivity, EPA could define the level of connectivity that would be protective or non-protective of downstream traditional waters of the US and have a fully workable definition. Stated briefly, a jurisdiction by rule of 'other waters' is intractable because science does not support such a distinction.

1.4 The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions.

In general, the excluded waters defined in the Rule seem reasonable but are vague in definition. For example, it is important to distinguish between artificial or natural systems that are still within the wastewater treatment train and receiving waters of the US. There is currently no general demarcation made between treatment wetlands versus receiving waters and this

causes a great deal of confusion in the regulated community. For example, requiring compliance of constructed treatment wetlands to the same standards as wetlands defined as waters of the US may impede the treatment techniques employed by the constructed wetlands and degrade their protective function. Once again, the scientifically significant effect on downstream traditional waters of the US needs to be technically established in order for this distinction to have meaning, particularly in the case of constructed wetlands that have been engineered to be isolated during treatment.

The exclusion of ditches by rule is a good first step. There is some uncertainty about the requirement that excluded ditches that:

> "do not contribute flow, either directly or through another water, to a water identified in paragraphs (a)(1) through (4) of this section."
>
> - FR, vol.79, no.76, p.22263

Once again, this is a dichotomous distinction and is not consistent with either the SAB review or published scientific opinion. Given enough rain, all ditches have the potential to contribute flow to a downslope waterbody, even in a topographically closed basin. Thus, it would be impossible to meet these criteria, unless some gradation, based upon scientifically significant effects, was established in the Proposed Rule.

It is not obvious why ditches that flow only in response to rainfall runoff, aka ephemeral ditches, are excluded by rule yet ephemeral streams are included by rule. This seems to imply that there are mitigating factors in the construction of ditches that make them more protective of downstream waters. This may be the case; however, without further discussion there is no technical reason in the Proposed Rule to presume this, in general.

The exclusion of rills and gullies by rule is also an excellent proposal. Much regulatory and industry effort has been expended on defining rills and gullies, particularly in the surface mining industry. Some progress has been made on the technical definition of rills and gullies, aka, temporary erosional features. It is important to understand that there is a distinction between transitory rills and gullies that lead to a stable, integrated hillslope drainage system and destructive rills and gullies that indicate faulty slope design or unintended changes in hillslope rainfall/runoff behavior. It is the latter that usually produces degradation of the physical and biological ecosystem. Once again, a gradient in the temporal and spatial scale is critical to the definition of a jurisdictional exclusion by either rule or on a case-specific basis.

It is important for the Proposed Rule to define excluded rills and gullies with temporal and spatial criteria of landscape stability that can be refined by the agencies in regulation or guideline.

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Dr. Duncan Patten

Patten Response to Questions Re: Scientific adequacy of draft policy of Waters of the US.

Question 1 response. The development of scientific support for there being a significant nexus between tributaries and traditional "waters" is more than adequate. The proposed rule explains how tributaries both individually and in aggregate can influence the physical, chemical and biological integrity of traditional waters. This is true as the tribs are shown to be an integral part of the watersheds that "feed" traditional waters. The science demonstrates that this is true whether the tributaries are perennial, intermittent or ephemeral.

Question 2 response. The significant nexus related to adjacent waters (including wetlands) to traditional waters is based on the science of hydrology and the demonstration of shallow aquifer connections. Without the shallow aquifer connections the wetlands would tend to fall into the "isolated" wetlands category and not be connected. Ecological science shows limited biological connections but these are important aspects of the connectivity and can be demonstrated scientifically through studies of the hyporheic zone.

Question 3 response. This description of a significant nexus of other waters that have to be considered on a case-specific basis requires a strict understanding of the actual connection that can be satisfied through relationships to other waters. Without the significant nexus which requires a thorough understanding of physical, chemical or biological connectivity, the connection will not hold. Thus, the qualifier of this condition is the need for scientific studies of each case and a general discussion of significant nexus in the policy and its supporting science is inadequate.

Question 4 response. The exclusion of specified waters in the policy where that exclusion occurs is generally sound and the science that supports these exclusions is also adequate to make such exclusions. Most of the exclusions are not interstate waters and are modified by human activity. Where modifications are made of traditional waters, those waters continue to be considered Waters of the US and though scientific studies might show the connectivity has been altered the status remains.

Question 5 response. The following text was prepared during a general review of the draft policy and might have several points that can be used in the discussion of the scientific adequacy of the policy.

General Comments:

The document uses the scientific foundation established in the "review of literature" document reviewed by the SAB panel. This whole document was included in the Federal Register document for draft policy. The document also bases some of its recommendations on interpretations of the several US Supreme Court decisions, thus both science and legal standing are a foundation of the draft policy.

The document lists what are recognized presently as Waters of US, i.e., interstate waters, navigable waters, tidal waters…how other waters relate to these, i.e., physical, biological and chemical influence (i.e., "connections to and interactions with"). These are then used to define and explain what are or will be considered Waters of US in the future and thus open to regulation.

The importance of the aggregated influence by water bodies on recognized Waters of the US is used throughout the document and science is used as the foundation for this. This, along with use of watershed as a spatially integrating entity, ecologically helps expand the concept of what might be defined as Waters of the US.

The document lists many water bodies that are not considered Waters of US and justification (science and legal) for these exclusions is sound and adds strength to justification for those water bodies that are included under this new policy.

In an attempt to explain "significance", which is described as a non-scientific term "in light of law and science", the document side steps to the use of "relative strength of downstream effects" to inform conclusions of significance; however, there is no clear explanation of what "relative strength" means or how it might be developed or determined. One assumes that use of "information" from the scientific literature review will address this, but this is not clear and a gradient of strength of connection should be developed as an influence of a water body on recognized Waters of the US that is small may be as important as one that is great.

Later in the document, "significant nexus" is explained as waters (including wetlands), either alone or in combination that significantly affects chemical, biological or chemical integrity of recognized Waters of US. Use of "significantly" in the definition of "significant nexus" is bothersome and there is little or no explanation (science or legal) of what "significant effect" means.

The document offers good and sound explanations of chemical, physical and biological connectivity which support other discussion points on these issues. Under physical connectivity there is some mention of "depth to water table" which is not clear. Under biological connectivity emphasis is placed on "life cycle dependency" on the aquatic resource which rightly eliminates many biological connections that are transitory, such as migratory birds that have no life cycle dependency of the water body.

Specific Comments:

Tributaries as Waters of the US. The document presents several ways nearly all tributaries are included as waters of the US and answers its own question of "why conclude all tributaries are Waters of the US?" These include:

A. Those the flow directly into recognized Waters of US.

B. Those that flow into or through tributaries included in A above.

C. Those that in aggregate influence the Waters of US.

When tributaries are considered "Waters of US", the document uses both science and legal concepts of "significant nexus" to demonstrate that the tributaries can be perennial, intermittent or ephemeral. This is a legitimate use of these water types as they all are scientifically shown to influence the physical, chemical or biological integrity of recognized Waters of US. This is explained in the text and demonstrated in the literature review. The importance of their being included as Waters of US is supported when the document states "the effects of small water bodies in a watershed need to be considered in aggregate" which emphasizes the importance of integration of effects from several water bodies. The proposed definition of waters of the US also emphasizes the importance of tributaries that "flow directly or indirectly" to a recognized water of the US. These waters would become "Waters of the US"… this legitimately builds on the concept of tributaries being Waters of US if they flow into or through tributaries that are recognized as "Wters of US". Science included in the literature review section supports this integration of the cumulative effects of several water bodies.

Other waters: the document mentions that there are "other waters" (than those already described as waters of US), which includes tributaries, that may be considered but emphasizes that these will be considered on a case specific basis. The use of case specific approach was much more common in earlier definitions of Waters of US and thus those being considered on a case-specific basis are fewer than earlier.

Concept of "adjacent" and/or "neighbor" appears to be used to support wetlands and riparian areas that are next to Waters of US, especially if there are shallow subsurface hydrological connections. This concept is confusing as in the past riparian areas were not included as "waters of US", so does this mean that they will be in the new policy? Wetlands as sources of water of parts of tributaries do become "Waters of US" under new policy. This is scientifically defensible because they are influencing hydrology and ecology of recognized Waters of US.

Ditches. The document discusses ditches that are not excluded. One such ditch, those with perennial flow is included but the source of this perennial flow should be considered as a part of accepting this kind of ditch as a Water of US.

Other water bodies mentioned: Playa lakes are discussed. They are excluded unless they are interstate bodies of water. This appears to be the only way "geographically isolated wetlands" are included under Waters of the US. These types of waters are fully described in Tiner's Wetland paper, "Geographically Isolated Wetlands of the United States" which describe the importance of these water bodies but also their isolation from recognized waters of the US. Is there science (hydrologic and/or ecologic) that should be considered that may make some of these isolated waters (wetlands) Waters of the US in addition to the interstate rule?

Dr. Mark Rains

Comments of the Proposed Definition of Waters of the United States

These comments are focused on and organized around the proposed definition of Waters of the United States, hereafter referred to as waters of the US. However, these comments in many cases resonate throughout the other sections of the proposed rule.

Summary

In general, the proposed rule is well-reasoned and adheres to the core conclusions in *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence* (EPA/600/R-11/098B, September 2013, External Review Draft), hereafter referred to as the *Connectivity Report*. To date, the SAB has recommended numerous revisions to the *Connectivity Report*. These recommended revisions are largely aimed at strengthening the *Connectivity Report*, rather than at changing the core conclusions of the *Connectivity Report*. Therefore, the proposed rule does not require major revisions. However, there are remaining issues that could be better addressed in the proposed rule and therefore better enable to regulated community to understand the scope of the proposed rule.

Type (a)(1) Waters: Traditional Navigable Waters

The Constitution and legal statutes provide clear authority for the federal government to regulate this type of water of the US. No further comment is offered.

Type (a)(2) Waters: Interstate Waters

The Constitution and legal statutes provide clear authority for the federal government to regulate this type of water of the US. No further comment is offered.

Type (a)(3) Waters: Territorial Seas

The Constitution and legal statutes provide clear authority for the federal government to regulate this type of water of the US. No further comment is offered.

Type (a)(4) Waters: Impoundments

The *Connectivity Report* and other literature clearly establish that impounding waters affects the chemical, physical, and biological integrity of both downgradient and upgradient waters. Downgradient effects are well established in the literature, with fundamental effects on ecosystem structure and function extending well downstream of the impoundment (e.g., Ward and Stanford 1995; Stanford and Ward 2001). In the upgradient direction, impoundments obviously inundate the impounded area, but also can have substantive effects further upgradient of the impounded area, such as raising groundwater and changing vegetation in adjacent wetland areas (e.g., Rains et al., 2004) and restricting upstream migration of anadromous fish (Raymond 1979). Therefore, there is a well-established and well-reasoned justification for defining these waters as waters of the US.

Type (a)(5) Waters: Tributaries

The *Connectivity Report* and other literature clearly establish that tributaries affect the chemical, physical, and biological integrity of downgradient waters. However, the definition of tributary remains somewhat unclear. This is typical of any effort to classify continuous landscapes (e.g., flowpaths from ridges to reefs) into discreet categories (e.g., hillslopes, headwater streams, mainstem rivers, nearshore marine environments). Still, this is an extremely important classification, especially on the upgradient edge where there is a transition from "not a water of the US" (e.g., hillslope) to "water of the US" (e.g., tributary). This "edge", of course, is not an edge at all – rather, it is a transitional area that changes in time.

The time element is particularly problematic, because the areas over which runoff is generated change in time. These "variable source areas" expand and contract and therefore change the way that landscapes connect through storms and seasons (Dunne and Black 1970). This has particularly important implications in regards to both infiltration-excess and saturation-excess overland flow, both of which being highly variable in space and time. It is through variable source area expansion and contraction that waters can be surface-water isolated at times to being the headward extent of tributaries at other times (e.g., Rains et al. 2008). In many landscapes, especially the arid and semi-arid western US, these intermittent or ephemeral connections are critical, providing much of the connectivity that facilitates the transport of mass, energy, and organisms to downgradient waters (e.g., Izbicki 2007).

Given these complexities, I think it important to clearly define the headward extent of tributaries. The proposed rule tries to do so, and does an admirable job of trying to draw that bright line. However, I think it important for the proposed rule to clearly discuss the difficulty of drawing such a bright line on a continuous landscape, allowing the flexibility to for field personnel to define functional tributaries, even where those functional tributaries might lack obvious indicators of bed and bank (e.g., alluvial deposits on the bed of a headwater stream in a humid mountain setting) but have less obvious indicators of tributary flows (e.g., directionally bent herbaceous vegetation and subtle debris lines in swales connecting vernal pools to downstream waters in arid and semi-arid settings).

Type (a)(6) Waters: Adjacent Waters

The *Connectivity Report* and other literature clearly establish that adjacent waters affect the chemical, physical, and biological integrity of downgradient waters. However, the Connectivity Report and this proposed rule could go a step further, defining adjacent waters as part of the waters to which they are adjacent. Rivers are not just channels – rather, rivers are channels and adjacent riparian areas, including all adjacent wetlands (Ward and Stanford 1995). Therefore, the proper functioning of the river, and therefore the chemical, physical, and biological integrity of downgradient waters, is a function of both channel and adjacent riparian areas, including all lateral exchanges of mass, energy, and organisms between the channel and the riparian area. While it may be convenient to separately define channels as type (a)(1) or type (a)(5) waters and adjacent wetlands as type (a)(6) waters, it is nevertheless important to acknowledge that this is a matter of convenience and that these are in fact one continuous and interconnected hydrologic system. Such an explanation would help justify the extension of the definition of waters of US to include these adjacent wetlands.

The proposed rule clears some existing confusion as to the meaning of "bordering, contiguous, or neighboring" by defining riparian area and floodplain consistent with the literature and common

scientific usage and further explaining that short, surface and shallow subsurface connections can connect wetlands outside the immediate riparian area and/or floodplain to the river. The proposed rule should consider stating that wetlands in the riparian area and/or on the floodplain are always adjacent, while wetlands outside the riparian area and the floodplain might or might not be adjacent, depending upon a significant nexus determination. (See "Other Waters", below for further discussion about case-by-case decisions.)

Type (a)(7) Waters: Other Waters

The *Connectivity Report* and other literature clearly establish that other waters can affect the chemical, physical, and biological integrity of downgradient waters, though they do so on a gradient from having negligible to important effects. The proposed rule therefore will treat these not as waters of the US by definition but, rather, as waters of the US on a case-by-case basis if there proves to be a significant nexus between the other wetland or group of wetlands and the chemical, physical, and biological integrity of downgradient waters. While the science supports this as a general approach, it will be important to carefully define what is meant by "case-by-case", and what happens following a case in which specific other wetland or group of wetlands are determined to be waters of the US.

The proposed rule defines a group of wetlands geographically, grouping wetlands only within a given watershed. The proposed rule then defines watershed as all land from which surface water could drain to the nearest single entry point to a type (a)(1)-(a)(3) water. Such a definition has some problems.

There could be innumerable groups on uplands directly adjacent to a linear type (a)(1)-(a)(3) water. Imagine, for example, a navigable river running along the toe of a hillslope with innumerable seeps and springs, each of which or small groups of which discharging at different single points of entry to the river. Further imagine that the seeps and springs are a single hydrologic system, recharging due to infiltration of precipitation at the ridgetop and expressing along a linear geologic contact that outcrops at a common elevation all along the hillslope. By the proposed definition of watershed, one might conclude that a significant nexus assessment would need to be conducted above every single point of entry, thereby conducting a significant nexus assessment many times over on the same hydrologic system. This would be a clear waste of effort, because a single, well-designed and well-conducted significant nexus assessment would likely suffice. And, if a single, well-designed and well-conducted significant nexus assessment would likely suffice in the case above, then the logical extension might be that a single, well-designed and well-conducted significant nexus assessment might also likely suffice for any single type of hydrologic system, if such a type of hydrologic system were well defined.

Consider, for example, vernal pools in the Sacramento Valley. Both east and west sides of the Sacramento Valley are draped with Pleistocene to Pliocene alluvial fans terminating at the Holocene basin floor along the Sacramento River. These alluvial fans are nearly level to undulating but gently slope toward the basin floor. They have well-developed drainage networks, being dissected by streams and rivers tributary to the Sacramento River. Major geologic formations include the Riverbank and Red Bluff formations, with the Riverbank formation being 130K-450K BP in age and the Red Bluff formation being 450K-1.08M BP in age (Helley and Harwood, 1985), both of which being old enough for substantive pedogenic processes to have occurred (Helley and Harwood, 1985; Smith and Verrill, 1998). The USDA–Natural Resources Conservation Service has mapped several soil series with silica- and iron-cemented duripans on these formations, including the Redding series. These formations are also old enough for substantive subaerial erosion to have occurred, so microtopographic relief also is well developed, with mound-depression topography and irregular to coherent and intermittent to seasonal drainage

networks commonly connecting depressions to streams and rivers tributary to the Sacrament o River (Smith and Verrill, 1998). The vernal pools and swales that occur on these hardpan soils have been extensively studied (e.g., Rains et al. 2006; 2008). Wherever they occur, they have common hydrological, geochemical, and biological attributes and processes, with such attributes and processes a function of the underlying geologic setting. This geologic setting does not only occur in a small, closely centered area – rather, this geologic setting repeats in mappable units all over both sides of the Sacramento Valley. If a significant nexus assessment is done on these types of vernal pools in one location, then it quite likely suffices for another similarly situated location.

The summary of this is that case-by-case should not be defined simply by proximity. Such a definition is inconsistent with scientific understanding of the controls on hydrological, geochemical, and biological structure and function. Such a definition also would place an undue burden on the regulated public, who would be required to repeatedly perform significant nexus assessments on the same types of wetlands. It would therefore be better to have a clear pathway by which entire classes of wetlands can be determined to have a significant nexus with the chemical, physical, and biological integrity of downstream waters and can thereafter be considered waters of the US by definition.

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Dr. Amanda Rodewald

Comments on scientific basis for rule – A. Rodewald

1. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment. This definition is based on the conclusion that a significant nexus exists between tributaries (as defined in the proposed rule) and the traditional navigable waters, interstate waters, and the territorial seas into which they flow. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

The scientific literature does support the idea that tributaries greatly impact the physical, chemical, and biological integrity of downstream waters through a wide variety of processes, including supplying water to rivers & other waters, transport of sediment and organic matter, provide habitat, and nutrient spiraling. In addition, most jurisdictional waters are fed by tributaries, many of which are intermittent in certain regions. In a report currently undergoing quality review by the Chartered SAB, the Connectivity Panel agreed that the scientific literature provided strong support that ephemeral, intermittent, and perennial streams have important downstream effects, and that connectivity occurs along a gradient determined by the frequency, duration, magnitude, predictability, and consequences of stream, watershed, and landscape processes. Although connectivity can vary among streams, the consequences of connectivity for the physical, chemical, and biological integrity of downstream waters are sufficiently strong that streams can be justifiable viewed as a category. For example, even short duration and highly episodic flow connections and/or long periods of dry conditions could be important to downstream waters. Based on the Panel's recent deliberations, the ruling that tributaries remain jurisdictional even with natural or human-caused interruptions seems consistent with the science even though interrupted streams also can show high variability in the degree of connectivity.

One concern that I have relates to what seems to be different definitions of tributary used in the scientific review and the rule. The scientific review focused on perennial, ephemeral, and intermittent streams, whereas the rule seems to include a wide range of waters, including lakes, ponds, ditches, and impoundments. In the below text excerpted from the proposed rule, I have underlined two sentences that seem to expand what is commonly thought of as a tributary to any type of water. This definition confused me because the extent to which non-stream waters are jurisdictional seems to be addressed under adjacent waters.

"Tributary: a water physically characterized by the presence of a bed and banks and ordinary high water mark, which contributes flow, either directly or through another water, to a water identified in paragraphs a1-a4. <u>In addition, wetlands, lakes, and ponds are tributaries (even if they lack a bed and banks or ordinary high water mark) if they contribute flow, either directly or through another water to a water identified in paragraphs a1-a3.</u> A water that otherwise qualifies as a tributary under this definition does not lose its status as a tributary if, for any length, there are one of more man-made breaks (e.g., culverts, dams, pipes, bridges) or one or more natural breaks (e.g., wetlands, debris piles, boulder fields) so long as a bed and banks and an ordinary high water mark can be identified

upstream of the break. A tributary, including wetlands, can be a natural, man-altered, or man-made water and includes waters such as rivers, streams, lakes, ponds, impoundments, canals, and ditches not otherwise excluded."

2. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment, or tributary. This definition is based on the conclusion that a significant nexus exists between adjacent water bodies (as defined in the proposed rule) and traditional navigable waters, interstate waters, and the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

The Connectivity Panel supported the conclusion in the EPA's report that floodplain wetlands and waters have strong impacts on the physical, chemical, and biological integrity of downstream waters. Wetlands and waters in floodplain settings are important buffers to pollution and nutrients, provide habitat, and retain sediments and nutrients and contaminants. This warrants the consideration of waters and wetlands in floodplain settings as a class falling under CWA jurisdiction.

As noted above, there was a mismatch between the definition of adjacent waters used in the rule and the floodplain settings in the review document. I assume that floodplain waters and wetlands are one type of adjacent water (i.e., neighboring and floodplain definitions), but not all of them.

3. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, 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 traditional navigable water, interstate water, or the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

The Connectivity Panel disagreed with the EPA Report's conclusion that the literature did not provide sufficient information to evaluate or generalize about the degree of connectivity or its downstream consequences. As such, the Panel requested better acknowledgement that the science does show that non-floodplain waters and wetlands can have strong and important impacts on the physical, chemical, and biological integrity of downstream waters.

The Connectivity Panel agreed that downstream consequences of waters and wetlands in non-floodplain settings will likely require a case-by-case evaluation that considers the magnitude, duration, frequency, predictability, and consequences of water, material, and biotic fluxes to downstream waters, and their impact on the integrity of downstream waters. An additional recommendation was to establish relevant guidelines identifying baseline temporal intervals that are likely to meaningfully connect non-floodplain wetlands and waters to downstream waters.

I'm unclear about the jurisdiction of wetlands that have a surface or subsurface water connection (italicized text from draft rule below). If a wetland in a non-floodplain setting has a connection

to the river network, then is it a tributary or an "other water"? Or is seeing the connection effectively the "case-specific analysis" needed to make it jurisdictional?

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 entire group of waters.

There was strong agreement among Panel members that connectivity assessments should explicitly consider aggregate and cumulative effects of wetland complexes. I was pleased to see that the rule provided guidance about how and when to aggregate with the phrase "similarly situated".

"*Other waters'' will be evaluated either individually, or as a group of waters where they are determined to be similarly situated in the region. Waters are similarly situated where they perform similar functions and are located sufficiently close together or when they are sufficiently close to a jurisdictional water. How these ''other waters'' are aggregated for a case-specific significant nexus analysis depends on the functions they perform and their spatial arrangement within the ''region'' or watershed. For other waters that perform similar functions, their landscape position within the watershed (i.e., the ''region'') relative to each other or to a jurisdictional water is generally the determinative factor for aggregating waters in a 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 and whether such effects are significant."*

The similarly-situated case for aggregation requires similar functions, but what if there is a wetland complex where some wetlands are connected and others are important for storage due to lack of connection?

"*A hydrologic connection is not necessary to establish a significant nexus, because, as Justice Kennedy stated, 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, interstate water or the territorial seas. These functional relationships include retention of flood waters or pollutants that would otherwise flow downstream to the traditional navigable water, interstate water or the territorial seas."*

I support the Agency's consideration of using subcategories that identify groups for which there is evidence of strong connections and thus should be jurisdictional.

I appreciate that they are trying to provide guidance on how to evaluate different kinds of connectivity, but these are largely describing how to identify the presence or absence of different "types" of connections, rather than the degree of those connections. (below)

p. 22214:

Evidence of chemical connectivity and the effect on waters can be found by identifying: Whether the properties of the water in question are similar or dissimilar to an identified (a)(1) through (a)(3) water; signs of retention, release, or transformation of nutrients or pollutants; and the effect of landscape position on the strength of the connection to the nearest ''water of the United States,'' and through it to an (a)(1) through (a)(3) water. In addition, relevant factors influencing chemical connectivity include hydrologic connectivity (see physical factors,

below), surrounding land use and land cover, the landscape setting, and deposition of chemical constituents (e.g. acidic deposition).

Evidence of physical connectivity and the effect on (a)(1) through (a)(3) waters can be found by identifying evidence of physical connections, such as flood water or sediment retention (flood prevention). Presence of indicators of hydrologic connections between the other water and jurisdictional water are also indictors of a physical connection. Factors influencing physical connectivity include rain intensity, duration of rain events or wet season, soil permeability, and distance of hydrologic connection between the ''other water'' and the (a)(1) through (a)(3) water, depth from surface to water table, and any preferential flowpaths.

Evidence of biological connectivity and the effect on waters can be found by identifying: resident aquatic or semi-aquatic species present in the ''other water'' and the tributary system (e.g., amphibians, aquatic and semi-aquatic reptiles, aquatic birds); whether those species show life-cycle dependency on the identified aquatic resources (foraging, feeding, nesting, breeding, spawning, use as a nursery area, etc.); and whether there is reason to expect presence or dispersal around the ''other water,'' and if so whether such dispersal extends to the tributary system or beyond or from the tributary system to the ''other water.'' Factors influencing biological connectivity include species' life history traits, species' behavioral traits, dispersal range, population size, timing of dispersal, distance between ''other water'' and an (a)(1) through (a)(3) water, the presence of habitat corridors or barriers, and the number, area, and spatial distribution of habitats. Non-aquatic species or species such as non-resident migratory birds that are not demonstrating a life cycle dependency on the identified aquatic resources are not evidence of biological connectivity for purposes of this rule"

4. The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions.

Tributary – it seems that the definition for tributary includes most types of water, by way of adding the two sentences underlined above in the response to question 1. Also on p 22197, the text talks about tributary streams, which were the focus of the scientific review, but then the rule adopts the broader definition.

How would the categorical exclusion of ditches that do not contribute flow, directly or indirectly, to a traditional navigable water affect the outcome of a request to establish a connection? Wouldn't that be important and jurisdictional under tributary definition? However, at the time of impact / construction/ alteration, the ditch would be excluded. (p.22194, bottom of 2nd column and top of 3rd column recognizes that the significance of certain adjacent waters is to prevent or delay a hydrological connection with downstream waters and store water or pollutants)

p. 22204: I am unclear about the following text. I thought that swales were one of the exclusions? If not, does that mean it is a case-specific other water?

" *Non-jurisdictional geographic features (e.g., non-wetland swales, ephemeral upland ditches) may still serve as a confined surface hydrologic connection between an adjacent wetland or water and a traditional navigable water, interstate water or the territorial sea, provided there is an actual exchange of water between those waters, and the water is not lost to deep groundwater through infiltration (i.e., transmission losse*s)."

5. If you have any other comments about the adequacy of the scientific and technical basis of the proposed rule, please provide them as well.

p. 22195-22196: It is really important that they articulate that (1) "significance" is not a scientific term but rather a determination of the agencies in light of the law and science and (2) the relative strength of downstream effects informs the agencies' conclusions about the significance of those effects for purposes of interpreting the CWA.

p. 22199 footnote: is it appropriate to use "in the region" and "watershed" interchangeably? In general, regions seem to include many watersheds.

p. 22208: Does the following text mean that connections via groundwater cannot establish connectivity?

"*Shallow subsurface connections are distinct from deeper groundwater connections, which do not satisfy the requirement for adjacency, in that the former exhibit a direct connection to the water found on the surface in wetlands and open waters*"

p. 22209: Here again, I'm confused b/c it sounds like nothing farther than an adjacent wetland or water will be jurisdictional; is that so? "*Waters located near an adjacent water but which are not themselves (independently) adjacent to an (a)(1) through (a)(5) water 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*."

Dr. Emma Rosi-Marshall

Aug 13, 2014

Below are my comments on the US EPA proposed rule entitled "Definition of 'Waters of the United States' Under the Clean Water Act". As requested in your memorandum dated July 16, 2014, I have provided comments on "the adequacy of the scientific and technical basis of the proposed rule cited above." Below I have copied the questions posed in your memo and under each question provide my response.

Specific Charge Questions

1. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment. This definition is based on the conclusion that a significant nexus exists between tributaries (as defined in the proposed rule) and the traditional navigable waters, interstate waters, and the territorial seas into which they flow. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (*lead discussants are: Drs. Emma Rosi-Marshall and Jennifer Tank*)

Response: The proposal includes tributaries in the definition of waters of the United States is based on a strong foundation of scientific research. There is ample scientific evidence that tributary streams are connected to downstream waters and that these connections can fundamentally influence the biological integrity of downstream waters. Scientific research for the past 40 years has documented the connections between headwater streams and downstream waters. These findings are reviewed in the EPA Draft Report on Connectivity and the SAB has provided additional suggestions and citations documenting these connections. There is ample scientific evidence published in peer-reviewed literature on the connections between tributary streams and downstream waters. In particular, research demonstrates that tributaries strongly influence the biological integrity of downstream waters. Inclusion of tributary streams in the definition of waters the US is based on a large body of scientific evidence. In addition, effective maintenance and/or restoration of the integrity of downstream waters will require protection of these tributary systems which feed into downstream waters.

The scientific and technical basis for the inclusion of tributaries is based on the well established evidence that the flux of water, nutrients, materials such as organic matter and contaminants, and the movement of biota, from tributaries to larger water bodies influences the biological integrity of downstream waters. The movement of multiple materials, beyond simply water, is essential for the maintenance of the chemical and biological integrity of downstream waters. The connections that exist between tributary streams and their downstream receiving waters are well described in the draft report by the EPA, in the comments by the SAB, and are well documented in the peer reviewed scientific literature. The wealth of information on these connections provides a very strong basis for this rulemaking and the proposed rule is defensible.

The definition of a tributary: "a water physically characterized by the presence of a bed and banks and ordinary high water mark as defined at 33 CFR, 328.3(e), which contributes flow either directly or through another water, to a water defined in paragraphs (a)(1) through (4)" is scientifically defensible. Much of the water that enters downstream waters originates in small headwater streams high up in watersheds. In some locations in the US, small headwater streams are intermittent, but intermittency does not negate the influence of these tributaries on downstream waters. Indeed, scientific research has shown that flows that occur intermittently, e.g. during a flood or spring snowmelt, can exert a strong influence on downstream systems. A definition of tributary that includes these small but extremely important systems, which are inherently connected to downstream waters via water and material flow, is necessary. Headwater streams, even when they only flow intermittently, exert a strong influence on the chemical and biological integrity of downstream waters. This assertion is based on a wealth of scientific evidence (reviewed in the EPA draft report on Connectivity, further elaborated on in the SAB's comments on the draft report, and found in the peer-reviewed scientific literature).

In addition, including wetlands, lakes and ponds in the definition of a tributary is defensible and necessary to protect and maintain the integrity of downstream waters. In the course of water flowing through a river network, the landscape can change and a small stream may flow into and then out of a pond, lake or wetland. These chains of aquatic habitats can be thought of as beads on a string that can act in concert to influence the biological integrity of downstream waters. In addition, pollution that enters into an aquatic system anywhere along a river network will be transported downstream and potentially impair the integrity of downstream waters. Whether the discharge occurs in a wetland, pond or headwater stream does not reduce its eventual downstream transport to larger waters and does not eliminate its impact.

In addition, I agree with the proposed definition that the "upper limit of a tributary is established where the channel begins". A great deal of scientific research demonstrates that these very small streams that begin high up in a watershed have high biological activity and can exert a strong influence of the downstream flow of water and materials, including nutrients, organic matter and animals. The flow of these materials has a large influence on the biological integrity of downstream waters as defined in in paragraphs (a)(1) through (4) of the proposed rule. In addition, pollutants that are discharged into a very small tributary stream will not remain in place, but will be transported downstream and have the potential to affect downstream waters. I concur that there is sufficient scientific evidence to include tributaries in the definition of waters of the US to maintain the biological and chemical integrity of downstream waters.

The additional need to consider the effects of small waterbodies in aggregate (see page 22196 of the proposed rule) were highlighted as an important conclusion of the EPA Report on Connectivity and the subsequent comments from the SAB Panel on Connectivity. This is an extremely important finding and there is scientific evidence that small waterbodies that are distributed throughout a river landscape can have effects in the aggregate. The effects of one small system on a large downstream waterbody may be difficult to ascertain, but many small systems in aggregate can have a large effect on the biological and chemical integrity of the larger downstream water bodies. This aggregation effect should be explicitly considered in the rulemaking process.

2. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment, or tributary. This definition is based on the conclusion that a significant nexus exists between adjacent water bodies (as defined in the proposed rule) and traditional navigable waters, interstate waters, and the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (*lead discussants are: Drs. Siobhan Fennessy and Mazeika Sullivan*)

Response: The inclusion of adjacent waters, including floodplain aquatic habitats and wetlands, in the definition of waters of the United States is also based on sound science. The biological integrity of river ecosystems is strongly linked to maintaining the connections between water bodies and their adjacent aquatic habitats. River ecologists have known for a long time that it is more appropriate to think of rivers as part of a larger landscape or "riverscape" comprised of a river's mainstem and adjacent floodplain or wetland habitats. The connections between the river and adjacent habitats, e.g. floodplain wetlands and marginal aquatic habitats, include the flux of materials (water, nutrients and contaminants) and the flux of organisms. The flux of these materials (e.g. the connectivity of these systems) is essential for maintaining the chemical and biological integrity of downstream waters. There are numerous examples of these connections provided in the EPA Draft Report on Connectivity, the SAB comments on the report and in the published peer reviewed literature.

The inclusion of adjacent waters, including wetlands, in the definition of waters of the United States is also based on a large body of scientific evidence that demonstrates that these systems are connected to larger water bodies and that these connections are crucial for maintaining the chemical and biological integrity of surface waters. Indeed, when these connections are severed, due to dikes, levees or wetland draining, research demonstrates that there are negative consequences for the integrity of downstream waters. The inclusion of these habitats in the definition of waters of the US is well grounded in scientific and technical understanding of how rivers are connected to adjacent aquatic habitats and how these connections influence the chemical and biological integrity of waters.

As mentioned above in response to question 1, the need to consider the effects of small waterbodies such as adjacent aquatic habitats in aggregate (see page 22196 of the proposed rule) is very important. There is strong scientific evidence that small waterbodies that are distributed throughout a river landscape have effects in the aggregate. The effects of one small adjacent system on a larger adjacent waterbody may be difficult to determine, but many small adjacent systems in aggregate will influence the biological and chemical integrity of waters.

3. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, 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 traditional navigable water, interstate water, or the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (*lead discussants are: Drs. Emily Bernhardt and Michael Gooseff*)

Response: The justification for "other waters" being evaluated on a "case by case" basis or as a group to determine the extent to which they have a significant nexus with downstream waters is well described in the proposed rule. I agree that considering groups of "similarly situated" waters and the extent to which they affect downstream waters in aggregate is justified and would alleviate the need for extensive "case by case" analysis. The approach to consider "similarly situated" systems and evaluate their connectivity as a group makes sense based on our ecological understanding of these systems, i.e. that similar systems in a region may act in similar ways and that not every water is unique. In addition, these systems should be considered in aggregate, as the degree to which they influence downstream waters will be more apparent when considered in aggregate.

The SAB Report provides additional information on how "other waters" should be defined and how they may be connected to downstream waters even when an apparent hydrologic surface flow is lacking. It is very important that the ideas put forward by the SAB in response to this section of the Connectivity Report be considered when making the final rule about "other waters". Although these systems may not be adjacent to downstream waters and therefore may lack an explicit surface water hydrologic connection, they may function, especially in aggregate, in ways that influence the biological and chemical integrity of downstream waters. These ideas are well developed in the SAB report and these ideas should be explicitly considered during the final rulemaking in regards to these "other waters".

4. The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions. (*lead discussants are: Drs. David Allan and Mark Rains)*

No comment.

5. If you have any other comments about the adequacy of the scientific and technical basis of the proposed rule, please provide them as well.

Appendix A, in the CFR document (starting on page 22222) appears to be a draft or a synopsis of the Connectivity Report. I assume that because the Connectivity report is still in draft form that this Appendix will be revised in the future. As such, I did not provide detailed comments or additional suggested references on Appendix A, as that is the content of the SAB's report. I hope that these suggestions will be incorporated into the draft report and that Appendix A will be revised accordingly.

Dr. Mazeika Sullivan

Preliminary Comments on "Waters of the United States Proposed Rule"
Mazeika Sullivan, 08.12.2014

Introductory Comments:

The scientific evidence supports a broad, systemic view of the goal of maintaining and improving water quality, as presented in the proposed rule. Consistent with the recommendations of the EPA SAB Panel, the collective scientific evidence indicates that there exists a gradient of connectivity between streams and wetlands and downstream waters. Although this gradient of connectivity is recognized at multiple locations in the proposed rule (e.g., 22193, 22198, 22223, 22226, 22248), this concept should figure as the conceptual backbone of the preamble in order to clearly establish the rationale for those cases where important connectivity exists and for those cases where it may not. This framework would then provide the basis on which subsequent discussion of various types of water bodies and whether or not a "significant nexus" exists with traditional navigable water, interstate water, or the territorial seas.

Within this context, variation in the strength of connectivity as measured through frequency, duration, magnitude, predictability (and other metrics) supports the conclusions that streams and wetlands (and other waters) in riparian and floodplain settings are unambiguously connected to and have impacts on downstream traditional navigable waters, interstate waters, and the territorial seas (or they are connected via tributaries). For "other waters", a gradient of connectivity can be used to interpret the magnitude of impacts on downstream waters and whether this magnitude justifies jurisdictional status under the CWA. Establishing a gradient of connectivity as the scientific framework would also clarify that there may not exist cases wherein there is no connectivity (in contrast to the statement on 22192: "Waters in a watershed in which there is no connection to a traditional navigable water, interstate water, or the territorial seas … "), although the degree of connectivity may not be sufficient to effect meaningful downstream impacts and, therefore, warrant classification as "waters of the United States".

The proposed rule addresses aggregate effects of streams, wetlands, and other waters on downstream waters (e.g., 22196, 22215, 22217, 22222, 22226) and mentions temporal variability in that "connectivity varies within a watershed and over time" (22197). The science supports this explicit recognition of the spatial and temporal scales at which streams, groundwater systems, and wetlands are functionally aggregated. Understanding the interactions of cumulative and temporal effects on downstream waters will also be critical to properly assess connectivity both over space and time.

It is my understanding that the agencies will review the SAB Report and make adjustments to the final rule that are deemed appropriate. Given that my comments and contributions relative to the synthesis of the supporting scientific literature are incorporated within the SAB Report, I have not provided extensive comments on this section (starting on 22222) at this time. I will briefly comment, however, that the synthesis of scientific evidence presented in the proposed rule is overall technically accurate and relatively thorough and provides support for the conclusions that streams and adjacent wetlands are physically, chemically, and/or biologically connected to downstream navigable waters; however, these connections should be considered in terms of a connectivity gradient that includes

frequency, magnitude, predictability, and consequences of connectivity pathways. On the other hand, the scientific literature supports more definitive statements that reflect how numerous functions of "other waters" sustain the physical, chemical, and/or biological integrity of downstream waters, although the amount of connectivity can vary widely. Additionally, as noted below, the role of biological connectivity is not sufficiently represented throughout the document.

As these are preliminary comments, I look forward to further discussion at the SAB Panel teleconferences (Aug. 20-21, 2014) to formulate more definitive conclusions.

1. *The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment. This definition is based on the conclusion that a significant nexus exists between tributaries (as defined in the proposed rule) and the traditional navigable waters, interstate waters, and the territorial seas into which they flow. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (lead discussants are: Drs. Emma Rosi-Marshall and Jennifer Tank)*

In keeping with the SAB Panel's conclusions, there is strong scientific support that streams exert strong impacts on downstream waters and that all tributary streams are physically, chemically, and biologically connected to downstream waters. In particular, the proposal that all waters that meet the definition of a tributary are "waters of the United States" by rule is technically sounds and supported by the available science, as perennial, ephemeral, and intermittent streams all influence the physical, chemical, and biological nature of downstream aquatic systems.

The science clearly supports protection of tributaries, including headwater streams and man-made or man-altered tributaries, under the CWA given the critical functions they perform relative to the larger drainage network (e.g., 22227, 22230, 222235). Relative to the proposed definition of "tributary", a broad definition that includes, in addition to streams and rivers, fluvial impoundments, canals, ditches (otherwise not excluded), and wetlands that connect tributary segments (i.e., wetland tributaries – which could also would be jurisdictional as "adjacent" waters") that are part of the tributary network is reasonable. However, including other features as tributaries that do not have a bed and bank and OHWM (e.g., 22202: "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, bottom and lateral boundaries, or other indicators of OHWM.") seems to extend the classification beyond the scope of the definition provided and is unnecessary as these water bodies are jurisdictional as "adjacent" waters. Alternatively, the definition of tributary could be expanded to provide consistency between the definition and the water bodies considered tributaries (including headwater lakes, ponds, wetlands, etc.). In determining tributaries, map scale will be an important consideration as differences in map resolution can lead to appreciable differences in estimating the extent of the watershed (e.g., Meyer and Wallace 2001, Heine et al. 2004). The following language (22201), "When considering whether the tributary being evaluated eventually flows to an (a)(1) through (a)(4) water, the tributary connection may be traced using direct observation or U.S. Geological Survey maps, aerial photography or other reliable remote sensing information, or other appropriate information.", may be insufficiently specific to ensure adequate estimation of the tributary network across different geographic regions that vary in land cover, geology, etc.

For further comment on aspects of the proposed definition related to non-jurisdictional features, see response to Question #4, below.

2. *The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment, or tributary. This definition is based on the conclusion that a significant nexus exists between adjacent water bodies (as defined in the proposed rule) and traditional navigable waters, interstate waters, and the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (lead discussants are: Drs. Siobhan Fennessy and Mazeika Sullivan)*

There is clear scientific evidence to support strong connectivity between adjacent wetlands and waters, including those waters separated from other "waters of the United States" by man-made barriers, natural river berms, dunes, etc., and traditional navigable water, interstate water, and the territorial seas, impoundment, or tributaries. In particular, the proposal to include adjacent waters, not only adjacent wetlands, as "waters of the United States" (e.g., 22199, 22272) is supported by the available science and is a technically sound recommendation (i.e., 22207: "The proposed rule proposes to change "adjacent wetlands" to "adjacent waters" so that water bodies such as ponds and oxbow lakes, as well as wetlands, adjacent to jurisdictional waters are "waters of the United States" by rule.") Consistent with the SAB Panel's assessment, the scientific literature unequivocally supports the finding that floodplains and waters and wetlands in floodplain and riparian settings support the physical, chemical and biological integrity of downstream waters. Indeed, river-floodplain systems are integrated ecological units (i.e., riverine landscapes and riverscapes, e.g., Thorp et al. 2006) and as such, adjacent wetlands and waters are intimately linked to downstream systems. The literature review on this subject (starting 22236) clearly supports strongly connectivity of adjacent waters, although a broader riverine landscape perspective would help provide a foundational underpinning for the literature synthesis.

The definition of the term riparian area (22207, 22263, 22272) as "an area bordering a water where surface or subsurface hydrology directly influence the ecological processes and plant and animal community structure in that area" is somewhat narrow in scope given the importance of riparian zones to stream function and water quality. Both the EPA Connectivity Report and SAB Panel Report provide ample documentation of the science supporting the myriad functions of riparian zones and connections that extend beyond hydrologic pathways. Some riparian zones in high-relief headwater catchments, for example, may have limited hydrological connections relative to downstream riparian zones but are still critical for maintaining stream function via controls on temperature, inputs of organic material, etc.

Relative to the proposed definitions of "adjacent" and "neighboring" (e.g., 22272), additional consideration should be given to the distance between the water body and the tributary in determining whether or not the water body is adjacent (in situations where a water body lies outside of the floodplain and riparian area of a tributary). Although distance can be one measure to help ascertain the degree of hydrological connectivity, biological and chemical connectivity should also be considered. Biological connectivity, in particular, can integrate spatially disparate water bodies through movement of organisms. This point is well articulated in the SAB Panel Report and could be used as guidance in refining how best to assess connectivity of water bodies outside of the floodplain and riparian zone and the question of "reasonable proximity" (e.g., 22208). Using hydrological connectivity here as the only linkage measure also seems inconsistent with other parts of the proposed rule. For example, relative to "other waters": (22213) "A hydrological connection is not necessary to establish a significant nexus, because, as Justice Kennedy stated, in some cases the lack of a hydrological connection would be a sign of the water's function in relationship to the traditional navigable water, interstate water or the territorial seas". Furthermore, the role of chemical and

biological connectivity is clearly recognized elsewhere in Section G. For instance, the proposed rule states: (22210) "The agencies proposal to determine "adjacent waters" to be jurisdictional by rule is supported by the substantial chemical, physical, and biological relationships between adjacent waters, alone or in combination with similarly situated waters and (a)(1) through (a)(5) waters."

The temporal component is of particular importance in floodplain systems and requires additional discussion. The SAB Panel Report suggests using the science of flood frequency-floodplain inundation to estimate connectivity, which may help in in ascertaining the appropriate flood interval to use. Nonetheless, regional/climatic differences in stream-floodplain dynamics, variable human impacts, and other sources of variability may suggest that the determination of the appropriate flood interval is best left to the professional judgment of the agency (22209).

Inasmuch as I understand that the agencies are seeking to reduce the burden of many case-specific situations, caution is warranted in some cases when the science may not be available to adequately determine where jurisdiction should or should not be asserted. Of the alternative options presented (22208), I do not believe that current scientific evidence supports asserting jurisdiction over adjacent waters only if they are located in the floodplain or riparian zone. However, other proposed options likely would need additional investigation at this point. Along a connectivity gradient, there may exist threshold levels of connectivity above which downstream influences are impactful to water quality and below which they are not. See responses to Question #5 for additional discussion of thresholds.

22208: "While they may provide the connection establishing jurisdiction, these shallow subsurface flows are not "waters of the United States". Similar to my comment below (Question #4), if the pathway of connectivity is not protected, then ultimately neither are downstream water bodies. Ensuring the mechanism of connectivity (i.e., that defines the "significant nexus") is critical.

3. *The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, 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 traditional navigable water, interstate water, or the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (lead discussants are: Drs. Emily Bernhardt and Michael Gooseff)*

Recognizing the myriad connections between non-floodplain and non-riparian waters and wetlands and downstream waters (via surface water, shallow subsurface flowpaths, shallow or deep ground water flowpaths, or through chemical and biological connections) with specific attention paid to the magnitude, duration, frequency, predictability, and consequences of these connections is critical to understanding that all water bodies are likely connected to some extent to downstream waters, although the degree of connectivity can vary widely. The proposed rule draws heavily on hydrological connections, and should weight other connections equally. For instance, there is growing scientific evidence regarding biological connections between non-floodplain wetlands and other water bodies and downstream waters, including the bulk exchange of materials via biota, biota as disease vectors, the movement of nutrients by biota. Other water bodies can also provide critical habitat, which can be essential for the life-cycle requirements of downstream species. There is some discussion of these points (e.g., 22214, 22222), but the full scope of biological connectivity is not fully established in the proposed rule (particularly relative to the role of biota as vectors of nutrients, contaminants, and other materials). For example, the proposed rule recognizes that even when hydrological connections are visibly absent, many waters still can influence downstream waters, yet

states that "However, such circumstances would be uncommon" (22249). To the contrary, birds and other organisms can be key movers of nutrients, plants (seeds), and invertebrates between wetlands and downstream waters across ranges of spatial scales (e.g., Figuerola et al. 2003, Green et al. 2008).

I believe that the science is currently available (partially summarized starting 22250) to demonstrate that sufficient connectivity exists without a case-specific analysis for certain subcategories of "other waters" (22216) (e.g., prairie potholes, Carolina and Delmarva bays, pocosins, Texas coastal prairie wetlands, western vernal pools). However, I do not believe that the science is sufficiently developed to support a determination to exclude any groups of "other waters" (or subcategories thereof, e.g., Great Plains playa lakes) from jurisdictional status at this time in spite of the resource-intensive nature of a case-specific analytical approach. Before such determinations are made, additional research is required to establish degree of connectivity, analysis of spatial and temporal variability, and threshold levels of connectivity. This research will be a requisite step in further refining rules relative to the jurisdictional status of "additional other waters of the US" and in particular, if "categories of 'other waters' are similarly situated and have a significant nexus and are jurisdictional by rule, or that as a class they do not have such a significant nexus and might not be jurisdictional" (22216-22217). The best way to incorporate the developing science in the future is an excellent question; I look forward to Panel discussion on this point.

Determining if waters are "similarly situated" is a reasonable approach with scientific support (22247). Biotic community assemblage and presence/absence of species might be other metrics used to assess similarity, along with the factors currently provided as examples in the proposed rule (22213: habitat, water storage, sediment retention, pollution sequestration). Whereas analyzing the chemical, physical, and/or biological effects "other waters" perform in concert with other similarly situated water bodies is technically sound, supported by the science, and provides a basis for decision-making, water bodies that are disparate relative to their characteristics and function may also contribute to the cumulative effects of the water bodies in a region, and thus there may be cases wherein it is appropriate to analyze "other waters" in the aggregate (in contrast to a whole-scale statement indicating that it would be "inappropriate … to consider 'other waters' as 'similarly situated' if these 'other waters' are located in different landforms, have different elevation profiles, or have differ soil and vegetation characteristics …" (22213). Determining by rule that "other waters" are similarly situated in certain areas of the country is an intriguing idea, although my initial reaction is that Level 3 Ecoregions may be too broad of a classification. Additionally, human alteration of watersheds can alter the types of connections to downstream waters as well as the magnitude, frequency, duration, predictability, and consequences of these connections. How would variability stemming from the role of humans on the watershed landscape be captured within a regional approach?

Relative to a case-specific basis for other waters, the proposed rule correctly recognizes role of aggregate and temporal effects. This is a key point in relation to assessing whether a water body has a "significant nexus". Determining when (temporally) surveys will be conducted, what map scale will be used (although this point is somewhat addressed on 22212, 22226), and how aggregate effects will be determined is critical to appropriate assessment of these case-by-case situations. For example, many current databases do not represent the full extent and/or size of the drainage network. For additional comments on this point, see responses to Question #1. This topic is also addressed in the SAB Panel Report.

4. *The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions. (lead discussants are: Drs. David Allan and Mark Rains)*

Discriminating between shorter-term erosional features (e.g., rills and gullies) and longer-term headwater channels represents a challenge relative to mapping (e.g., James et al. 2007) as well as to the nature of ecological transitions between, for example, gullies and ephemeral streams. However, to exclude these and other variable source areas (e.g., swales) from jurisdiction is not fully supported by the available science as they can be important components of integrated aquatic systems with measurable impacts to downstream systems. For instance, Hansen and Law (2006) found that small gullies in South Carolina contributed runoff and sediment during tropical storm episodes of a magnitude of 48 tonnes from a 0.1-ha discontinuous valley side gully over 9.5 years. Thus, consideration of these features in the aggregate and over variable temporal scales is important relative to downstream impact. The SAB Panel Report provides further suggestions and guidance relative to these erosional features, and emphasizes that the important role of these source areas to downstream connectivity. Thus, the agencies should maintain the right to classify specific gullies, rills, and swales (either separately or in the aggregate) as jurisdictional when warranted. The agencies are proposing to not retain authority to determine in a particular case that these waters are a "water of the United States" (22218), and I remain unconvinced that this determination is fully in keeping with the available science.

In general, the rationale for excluded waters focuses on physical features (channel morphology, flow permanence, etc.). There is an alarming lack of evidence provided relative to making the case for a lack of biological and/or chemical connectivity. While I agree that some of these waters should not be jurisdictional, consideration of other measures of connectivity may aid in making appropriate determinations as to which should be considered on a case-specific basis (or potentially as a class). To determine regulatory practices only on one dimension of connectivity is problematic and may indicate it is premature to move fully away from a case-specific basis for all the waters listed on 22218, 22263, 22274. For example, drainage ditches have been shown to exhibit a range of ecological functions (see Herzon and Helenius 2008) and while hydrological connectivity is clearly important, other types of connectivity should also be considered. Also, how is connectivity that may not be initially present but would be expected to develop over time viewed? For instance, does an artificial lake or pond created by excavating and/or diking dry land and used exclusively for stock watering, irrigation, settling basins, etc. that is likely to develop a strong connection with a traditional navigable water body in the future remain non-jurisdictional?

There are other points that warrant discussion. For example, 22219: "It is important to note, however, that even when not jurisdictional waters, these non-wetland swales, gullies, rills and specific types of ditches may still be a surface hydrologic connection for purposes of the proposed definition of adjacent under paragraph (a)(6) or for purposes of a significant nexus analysis under paragraph (a)(7). For example, a wetland may be a ''water of the United States,'' meeting the proposed definition of ''neighboring'' because it is connected to such a tributary by a non-jurisdictional ditch that does not meet the definition of a ''tributary.''" The entire concept of water body connectivity is that integrated ecological units comprised of aquatic systems distributed across the landscape are intimately linked through a suite of pathways. How is it consistent with this notion or in the spirit of the CWA that the ditch that connects two "waters of the US" is not jurisdictional?

In summary, the current science supports that some "other waters" are unlikely to be sufficiently connected to warrant jurisdiction (e.g., artificial reflecting pools, swimming pools, artificially

irrigated areas, depressions with water following construction) but I am not convinced that the science currently exists to summarily exclude certain groups other waters including gullies, swales, artificial lakes and ponds, and ditches that do not contribute flow to a jurisdictional water body. These waters should be assessed along a gradient of connectivity on a case-specific basis until the science is available to make an appropriate determination for the respective class as a whole.

5. *If you have any other comments about the adequacy of the scientific and technical basis of the proposed rule, please provide them as well.*

Significance: The Proposed Rule points out that "significance" is not a scientific term (e.g., 22195). However, it is a statistical term, often used in scientific contexts to indicate when observations are "real" versus those observed by chance. Other terms that do not carry such meaning may be more appropriate: e.g., important, substantial, impactful.

Nexus: "Nexus" by definition refers to a series of things linked together or something of greatest importance. Either definition is not fully reflective of linked aquatic ecosystems. Moreover, it is not just a "significant nexus" but rather a significant impact resulting from connectivity, which is in question. Perhaps: "nexus of significant/important impact" would be a more accurate phrase, which would be consistent with the definition provided in the proposed rule (22199-22200, 22273).

Ecological thresholds: Ecosystems may not respond to gradual changes in smooth and/or linear ways, but rather with sudden, discontinuous shifts to an alternative stable state as the ecosystem exceeds a tipping point in one or more of its principal processes (Ludwig et al. 1997). Such thresholds – conditions beyond which an abrupt change in a quality, property, or function of an ecosystem are precipitated – are tightly linked to ecosystem condition (see Turner 2002). Understanding and targeting potential threshold levels of connectivity between water bodies and downstream waters could substantially contribute to our current understanding if and where threshold levels of connectivity occur along the connectivity gradient that includes frequency, magnitude, predictability, and consequences of connectivity pathways. There is a growing body of literature on environmental and ecological thresholds (e.g., Friedel 1991, Bledsoe and Watson 2001, Church 2002, Richardson et al. 2007, Evans-White et al. 2009, King et al. 2011, Chambers et al. 2012, Goss et al. 2014) as well as suite of analytical methods (e.g., Clements et al. 2007, Gido et al. 2007, King and Richardson 2003, Richardson and Qian 2007, Richardson et al. 2007, Sonderegger et al. 2009, King et al. 2011, Daily et al. 2012). This could be an area of importance for future research.

Navigable waters: If only a section of a water body is "navigable-in-fact" (22253), is the entire water body jurisdictional (e.g., a navigable river where the upper extent of the mainstem may not be navigable)?

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Dr. Jennifer Tank

Comments to the chartered EPA-SAB on the adequacy of the scientific and technical basis of the proposed rule titled *Definition of Waters of the United States Under the Clean Water Act*.

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Questions
1. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment. This definition is based on the conclusion that a significant nexus exists between tributaries (as defined in the proposed rule) and the traditional navigable waters, interstate waters, and the territorial seas into which they flow. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (lead discussants are: Drs. Emma Rosi-Marshall and Jennifer Tank)

General Comment:
Given my expertise and familiarity with the science associated with the Connectivity Report, informing the proposed rule, I found the proposed definition of "tributaries" to be accurate and clearly written.

Specific Comments:
P22203, C1, P2, L16 AND P22206, C2, P2: I am also supportive of the alternate interpretation that wetlands that connect tributary segments would be considered "adjacent wetlands", and as such would be jurisdictional waters of the United States under (a)(6). As such, wetlands would not be considered tributaries, but would remain jurisdictional as adjacent waters.

P22203, C2, P2. L50: In response to the query, I suggest that the flow regime in identified ditches should be less than intermittent flow, rather than less than perennial flow as proposed, based on my familiarity with the science associated with the Connectivity Report. This would apply only to those ditches not excluded by the proposed regulation and that meet the proposed definition of tributary as ''waters of the United States.''

2. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment, or tributary. This definition is based on the conclusion that a significant nexus exists between adjacent water bodies (as defined in the proposed rule) and traditional navigable waters, interstate waters, and the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (lead discussants are: Drs. Siobhan Fennessy and Mazeika Sullivan)

General Comment:

Given my expertise and familiarity with the science associated with the Connectivity Report, informing the proposed rule, I found the proposed definition of "adjacent water bodies" to be accurate and clearly written, which includes definitions of the terms "neighboring", "riparian area" and "floodplain".

Specific Comment:
P22209, C1, P2, L38: I am supportive of keeping text as written whereas best professional judgment is used to determine which flood interval is appropriate to determine if a water is located in the floodplain of a jurisdictional water, rather than providing greater specificity.

P22209, C2, P3, L1: I am supportive of the proposed deletion of the parenthetical text from the existing ''adjacent wetlands'' regulatory provision of the phrase ''other than waters that are themselves wetlands''.

3. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, 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 traditional navigable water, interstate water, or the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition. (lead discussants are: Drs. Emily Bernhardt and Michael Gooseff)

General Comment:
Given my expertise and familiarity with the science associated with the Connectivity Report, informing the proposed rule, I found the proposed definition of "other waters" to be accurate and clearly written.

Specific Comment:
Pg 22212, C1, P2, L14: In response to the request by the agencies for comments on the listing of "other waters", I am supportive of the rule as it stands whereby the agencies "do not propose to re-promulgate this list of ''other waters'' because it is unnecessary and has led to confusion where it has been incorrectly read as an exclusive list."

Pg22214, C3, P1, L2: In response to the request by the agencies for feedback on "the inclusion of subcategories of types of ''other waters,'' either alone or in combination with similarly situated waters, that can appropriately be identified as always lacking or always having a significant nexus", I suggest that Comments made through the SAB review of the Connectivity Report could provide suggestions appropriate for inclusion.

4. The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions. (lead discussants are: Drs. David Allan and Mark Rains)

General Comment:

Given my expertise and familiarity with the science associated with the Connectivity Report, informing the proposed rule, I found the descriptions proposed other definitions and exclusions to be accurate.

5. If you have any other comments about the adequacy of the scientific and technical basis of the proposed rule, please provide them as well.

Pg 22193,C2, P3, L8 AND Pg 22197, C3, P4, L8: Replace "is not an all or nothing situation", with "is a gradient" as that concept is central to the Connectivity Report on which the rule is based.

Pg 22194, C3, P1, L5: Recommend inserting "and recurring" after "systematic" to better reflect the nature of the interactions occurring in a watershed.

Pg 22196, C1, P2, L34: Recommend replacing "mercury" with "contaminants" as the Connectivity Report covers contaminants more broadly than just mercury.

Pg 22196, C1, P3, and continuing in C2: Up until this point, the term tributary has been used, and here the term "stream" is introduced, presumably interchangeably. This may be confusing, and if tributary rather than stream is appropriate, then it should be used consistently throughout.

Pg 22196, C2, P1, L3: Recommend "take up and change nutrients" be replaced with "assimilate and transform nutrients", if not deemed too technical.

Pg 22196, C2, P2, L15: Recommend that the statement "such that the significance of the connection is difficult to generalize across the entire group of waters." be modified so as to be consistent with revision to the Connectivity Report, where the concept of "gradient of connectivity" was introduced in this context.

Pg 22197, C2, P1, L24: Recommend replacing "nitrogen" with "nutrients", to be consistent with role of streams in transforming multiple nutrients, not just nitrogen.

Pg 22197, C2, P3 and continuing in C3: This text should be revised to be consistent with any changes made to the Connectivity Report in response to SAB review. At present, the content does not reflect the consensus that "non-adjacent waters reflect a continuum of connectivity" which is the sentiment of the SAB Review based on current scientific understanding.

Pg 22222, C1, Appendix A: The text provided in this summary of scientific evidence should be updated and consistent with any changes that are incorporated in response to the SAB Review of the Connectivity Report.