Revised Preliminary Individual Comments from Dr. Allison Aldous 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 18, 2014)

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Responses to questions regarding the definition of "Waters of the United States" under the Clean Water Act.
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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) or Hydrologic Landscape Regions (p. 22216) approaches for considering wetlands and waters to be similarly situated. Other approaches to regional classification of freshwater ecosystems are also available, including TNC's Ecological Drainage Units (Higgins et al. 2005) and WWF's Freshwater Ecoregions (Abell et al. 2008). Care must be taken in selecting the appropriate method as all have strengths and weaknesses. In particular, the method selected should emphasizes hydrologic flowpaths over current water chemistry.

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.

References:

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