DUCKS UNLIMITED

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November 5, 2014

The Honorable Gina McCarthy
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

The Honorable Jo-Ellen Darcy
Assistant Secretary of the Army, Civil Works
108 Army Pentagon
Washington, DC 20310

Attn: Docket ID No. EPA-HQ-OW-2011-0880

Dear Administrator McCarthy and Assistant Secretary Darcy:

Ducks Unlimited (DU) was founded in 1937 by concerned and farsighted sportsmen conservationists. Our mission is to conserve, restore, and manage wetlands and associated habitats for North America's waterfowl, and for the benefits these resources provide other wildlife and the people who enjoy and value them. DU has grown from a handful of people to an organization of over 1,000,000 supporters who now make up the largest wetlands and waterfowl conservation organization in the world. With our many private and public partners we have conserved more than 13.3 million acres of habitat for waterfowl and associated wildlife in the U.S., Canada, and Mexico.

Ducks Unlimited is first and foremost a science-based conservation organization. Every aspect of our habitat conservation work is rooted in the fundamental principles of scientific disciplines such as wetland ecology, waterfowl biology, hydrology, and landscape ecology. Thus, the perspectives on the Clean Water Act (henceforth, “the Act” or “CWA”) and information that we offer here are based on our extensive grounding in these scientific disciplines.

In addition, however, as day-to-day practitioners of on-the-ground wetland conservation in every state in the Nation, we have extensive, hands-on experience in complying with the CWA’s regulatory components. Thus, DU not only sees the CWA through the lens of its importance to our organization’s conservation mission, but we also view it through the lens of being a part of the CWA’s “regulated community.” This puts DU in a somewhat unique position relative to the Act.

DU has very limited landholdings, and the vast majority of our wetland and waterfowl conservation projects are conducted on lands owned and managed by others. While some of our projects are conducted on public lands, most of the lands on which we have worked in the U.S. are privately owned. Thus, an additional important perspective that Ducks Unlimited brings to this issue stems from our strong, longstanding, and ongoing partnership with the agricultural and ranching communities. Even more importantly, we have worked at a personal level with thousands of individual farmers and ranchers who contribute significantly to the conservation of wildlife and other natural resources on their lands, while at the same time earning their living from those lands. In addition, hundreds of thousands of DU members and volunteers are farmers or ranchers, members of their families, from farming/ranching communities, or are associated with the Nation's vital agricultural and livestock-based economy. Thus, while we do not purport to represent the farming and ranching communities' views on the Clean Water Act, we are sensitive to their perspectives and concerns.

Some farmers and ranchers with whom we have spoken about this issue have stated that they do not have a concern with conserving the remaining natural wetlands that store waters they use and, in a great many instances, from which they also derive pleasure as a direct result of the fish and wildlife that use those habitats and share their lands. Their primary concern is that CWA jurisdiction not be expanded beyond that which has long existed under the current regulations, and that a new rule should not subject them to new or additional restrictions or CWA permitting requirements that would affect their day-to-day ability to farm or raise livestock.

Structure of Ducks Unlimited's Comments (page #):

I. Introductory Comments and Context for DU's Review and Analysis of the Proposed Rule

A. The touchstone for the final "Waters of the U.S." rule and future administration of jurisdiction must be the primary purpose of the Clean Water Act – *"to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."*

The "legal analysis" contained within Appendix B of the proposed rule, as well as references throughout the document, cite and highlight the primary purpose of the Act. Needless to say, it is critically important to the issue of assessing jurisdictional limits to keep in mind the purposes of the Act and the intent of Congress. The overarching intent of the Act, as expressly articulated by Congress, was "to establish a comprehensive long-range policy for the elimination of water pollution." The Act's well-known primary purpose, cited above, underscores their intention. In addition, Congress directed the agencies to "develop comprehensive programs for preventing, reducing, or eliminating the pollution of the navigable waters and ground waters and improving the sanitary condition of surface and underground waters."

The legislative history of the Act makes clear that the 1972 Act was intended to curb and eliminate pollution of the Nation's waters. Congress also clearly understood that achieving their objective would require broadly protecting the inter-connected waters of the U.S., including its wetland resources. This goal has been shared by the states, who cooperatively administer the Act. In contexts as recent as comments to the 2003 Advance Notice of Proposed Rulemaking and an amicus brief from states' attorneys general and the District of Columbia in the *Rapanos / Carabell* case, at least 42 states expressed support for broad, federal jurisdiction of wetlands and other waters under provisions of the Clean Water Act.

Thus, while a new rule is clearly necessary to appropriately interpret the findings of the Supreme Court and formally incorporate them into the regulations that are used to administer the Act, it is important to promulgate the new rule with the purpose of the Act as expressed by Congress at the forefront - "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." We believe that Justice Kennedy's language in his *Rapanos* opinion provides a strong legal foundation for doing that and, in essence, includes a mandate to develop the new rule based on the related science. We recognize and accept that Justice Kennedy's language imposes limits that will have the effect of limiting jurisdiction of "waters of the U.S." under the new final rule to fewer waters than are jurisdictional under the existing rule. However, we believe, and will attempt to demonstrate through the synthesis of existing and emerging science, that protection by rule of some additional subcategories of "other waters" is consistent with the science and with the Supreme Court's rulings, and would in turn help achieve other important goals and objectives of the rule, most notably including the nearly universal desire for clarity, certainty, and predictability on the part of the regulated community as well as the regulating agencies.

B. Ducks Unlimited's review and comments regarding the proposed rule were developed with five primary criteria in mind, which we suggest would be useful for the agencies to expressly consider to help guide the numerous decisions that will be enshrined within the final rule:

   a. Is it consistent with the preponderance of the available and emerging science?
   b. Is it consistent with Justice Kennedy's language regarding the application of science to determining jurisdiction?
   c. Will it promote increased clarity, certainty, and predictability?
   d. Is it scientifically and administratively efficient and pragmatic?
   e. Is it consistent with the agencies' public statements that the new rule would not be an expansion of jurisdiction relative to the existing regulations, and that the agricultural and ranching sectors, in particular, would not be subject to increased permitting requirements?

In light of DU's somewhat unique perspective as a wetland conservation organization that is also part of the regulated community and works in close partnership with thousands of farmers, ranchers, and other landowners, we developed these comments and assessed the individual elements of the proposed rule through the lens of five key criteria above. It is clear that the agencies also considered similar criteria to some degree. However, we believe that some of the preliminary decisions as expressed as elements of the proposed rule are not as consistent with the fulfillment of and balance among these criteria, taken together, as they could or should be. Our detailed comments will touch on those areas of divergent perspectives, and we will offer scientific evidence that we believe supports our position on those issues. First, we offer comments on each of our five criteria.

a. Is it consistent with the preponderance of the available and emerging science? It is clear through an examination of the draft report of the EPA's Scientific Advisory Board entitled, *"Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of the Scientific Evidence"* (henceforth, the "Report" or "Connectivity Report"), that there is a large and diverse body of science regarding wetland and other aquatic components of the environment that relates to this rule. While there is much in the existing literature that informs a science-based evaluation of the fundamental question of "significant nexus" between various types of waters, the specific issue of connectivity between waters is experiencing a recent acceleration of research as a result of the Supreme Court decisions and the new importance of connectivity *per se* having become evident. Thus, this science is rapidly emerging and relevant new research appearing frequently in new issues of related journals and other publications.

An extremely important, overarching issue in the finalization of the rule is the extent to which the existing science can and will be appropriately generalized. It is clear that much of the past research was not conducted to answer questions related to the specific issue of connectivity in the current context of a "significant nexus" analysis. In addition, the distribution of past research, geographically and across wetland types, was influenced less by the need to fill gaps in the science that would ultimately be important in a regulatory context, than it was influenced by factors such as the coincidental proximity of universities and other adequately funded research entities to wetlands and wetland systems. Only very recently has research increasingly focused on key wetland landscapes for the explicit important purpose of seeking information related to specific questions of connectivity in recognition of the need for this kind of information to provide the foundation for assessment of significant nexus, jurisdiction, and conservation.

Nevertheless, the existing and growing body of science is demonstrating key generalities regarding the functions of wetlands and their connectivity with other waters, particularly downstream waters. These wetland functions and generalizations regarding connectivity are addressed in detail in the Report, the science appendix to the proposed rule, and emerging literature that currently appears in neither. While we recognize the tremendous variability in the level to which any particular wetland, or wetlands in the aggregate in some landscapes provide for the suite of functions that wetlands serve, essentially all wetlands provide functions which, if disrupted, have the potential to affect other waters as a result of their nexus with them. Of course, a key issue is the significance of that nexus. The level of significance is not only a science-based function of the size, density, and functional proximity and relationship of wetlands to downstream waters evaluated within the context of the appropriate ecological scale, but also a reflection of society's willingness to accept the level of risk associated with the impacts (e.g., increased flooding, decreased water quality, increased toxic algal blooms, degradation or loss of fish and wildlife habitats, etc.) that are observed as a consequence of cumulative wetland loss at local, regional, and national scales.

Thus, in reviewing the proposed rule and related scientific literature, and in developing our comments, we have tried to apply an approach similar to the "weight of evidence" approach described by Omernik (2004) in the context of defining ecoregions. This approach is a more qualitative approach as opposed to being "rule-based." We believe that a basis for its reasonableness in approaching the science-based issues at the center of this proposed rule is fundamentally related to the similarity between the two situations (i.e., ecoregion definition and assessment of significant nexus for "other waters") – a need for consistent decision-making and application of a national rule in the face of incomplete and imperfect information across the U.S. Nevertheless, although information may be incomplete and imperfect relative to evaluation of a specific situation, using the "weight of the evidence" approach to draw and appropriately apply information from wetlands in the same general region, in the landscape setting, and/or for wetlands in general, allows a reasonable *a priori* assessment by the agencies of whether or not the wetlands in a particular landscape or ecoregion are likely to have a significant nexus with downstream waters. We will expand upon this in more detail in the section on ecoregional analyses.

Some of Justice Kennedy's language regarding categorical and/or regional protection of wetlands seems to explicitly invite this approach. Furthermore, in their 9-0 *Riverside Bayview* decision, the Court explicitly recognized that while *"not every adjacent wetland is of great importance to the environment of adjoining bodies of water,"* "*if it is reasonable for the Corps to conclude that in the majority of cases adjacent wetlands have significant effects on water quality and the ecosystem, its definition [of adjacency] can stand."* We believe that this is a clear indication of the Court's willingness to accept the "weight of the evidence" approach and reasonable generalization of existing science.

As we have reviewed the proposed rule and the science related to the issue of whether the wetlands in particular landscapes, such as the Prairie Pothole Region, have a significant nexus to downstream waters, we have sought to apply the "weight of the evidence" approach to address the fundamental question of:

> "If all the similar wetlands in a particular region, in the aggregate, were to be filled and/or drained, based on the weight of the existing evidence and science, is it more likely that (1) there <u>would</u> be a significant impact, or (2) there <u>would not</u> be a significant impact on downstream waters?"

We encourage the agencies to take this approach to assessing which categories and subcategories of "other waters," in particular, should be determined to be jurisdictional by rule based on the weight of all the related scientific evidence.

b. Is it consistent with Justice Kennedy's language regarding the application of science to determining jurisdiction? Justice Kennedy's language places the science of connectivity between wetlands and downstream navigable waters (or other jurisdictional waters in the context of the proposed rule) front and center. He makes it clear that if there is a "significant nexus" between these waters, they should be considered jurisdictional to help fulfill the fundamental purpose of the Act. His apparent understanding that a *lack* of connectivity via surface waters can provide the basis for a significant nexus, particularly when viewed in the aggregate, in some cases (such as the prairie potholes), is insightful and demonstrates his acceptance and intent that science be the foundation for jurisdiction.

It is also useful to examine one of the primary examples he referenced in his opinion to gain insights into his view of the intent and purpose of the Act, and of his view of the end product of defining and applying CWA jurisdiction. Justice Kennedy states:

> *"Important public interests are served by the Clean Water Act in general and by the protection of wetlands in particular. To give just one example,* amici *here have noted that nutrient-rich runoff from the Mississippi River has created a hypoxic, or oxygen-depleted, "dead zone" in the Gulf of Mexico that at times approaches the size of Massachusetts and New Jersey* [cites omitted]. *Scientific evidence indicates that wetlands play a critical role*

> *in controlling and filtering runoff* [cites omitted]. *It is true, as the plurality indicates, that environmental concerns provide no reason to disregard limits in the statutory text, but in my view the plurality's opinion is not a correct reading of the text. The limits the plurality would impose, moreover, give insufficient deference to Congress' purposes in enacting the Clean Water Act and to the authority of the Executive to implement that statutory mandate."*

Justice Kennedy's choice of the Gulf of Mexico's perennial hypoxic zone is informative and important in that the development of this particular example of degradation of the Nation's waters could not have been prevented or ameliorated by applying jurisdiction to only navigable-in-fact waters, their tributaries, adjacent waters, and wetlands that occur in floodplains. Only through safeguarding the functions provided by the millions of wetland basins and tens of millions of acres of wetlands that are (or were) distributed across much 1.2 million square mile Mississippi River watershed could the situation of the Gulf of Mexico hypoxic zone have been potentially prevented or managed at a lesser scale. It is in part because significant nexuses existed between these now long-gone wetlands, in the aggregate, and downstream waters ultimately leading to the Mississippi River and the Gulf of Mexico, that the hypoxic zone is as expansive as it is today. This fact, in conjunction with Justice Kennedy's follow up language regarding "deference to Congress' purposes in enacting the Clean Water Act," seems a clear indication of the breadth of jurisdiction to which he opens the door, assuming that the weight of the scientific evidence for significant nexus exists.

Despite the expansive view he expressed regarding the purpose of the Act and choice of the hypoxic zone as an example of the kind of situation it was intended to prevent, Justice Kennedy's language in its totality places an outer limit on jurisdiction so that not every, tiny water body with an inconsequential connection to downstream waters could fall within the scope of the Act. There must be a "significant nexus" of wetlands and other waters, in the aggregate, with downstream navigable waters, recognizing that even wetlands lacking a surface connection can have the required significant nexus. Thus, his language provides the basis for placing wetland, hydrologic, and related sciences at the forefront of determining jurisdiction such that, as long as his conditions are met, jurisdiction can be applied in order to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters," including that required to prevent the degradation of the Gulf of Mexico.

c. Will it promote increased clarity, certainty, and predictability? The language of the proposed rule contains many references to the agencies' desire to provide increased clarity, certainty, and predictability, perhaps best summarized by the statement, *"The agencies' goal is to promulgate a rule that is clear and understandable and protects the Nation's waters, supported by science and consistent with the law."* We couldn't agree more with the importance of each component of that well-articulated and appropriate goal.

The EPA published a list that demonstrated the wide diversity and large number of governmental entities, elected officials, trade organizations, and conservation organizations that are all on record expressing their desire for a new rule in recent years. The almost universally agreed-upon and principal desire was that a new rule should increase the degree of certainty regarding the scope of jurisdiction in a clear, understandable, and pragmatic fashion. It seems clear to us that the agencies have taken that to heart and have attempted to develop a proposed rule with those characteristics. Many have expressed concern about the draft rule as falling short of that goal, and while DU agrees that there are improvements that can be made to the proposed rule in some respects, we appreciate the agencies' efforts in formulating the draft and their expressed willingness to make changes in the final rule to better achieve its stated goals. We will offer specific comments for ways in which we believe clarity, certainty, and pragmatism can be significantly advanced. We encourage the agencies to continue to apply this criterion to the numerous individual decisions that will need to be made in the process of finalizing the rule, and to pay careful attention to the many requests for clarity that we know will be submitted during the comment period.

d. Is it scientifically and administratively efficient and pragmatic? At the intersection of our comments above with respect to "clarity, certainty, and predictability" and the encouragement to broadly apply a "weight of evidence" approach, is the issue of predictability. In the end, a rule will only be effective if it is not only clear, founded in science, and consistent with the existing judicial record, but it must also be realistic from the standpoint of what can be pragmatically accomplished, both administratively and scientifically.

Many of the strongest pieces of research that provide the strongest and most compelling evidence regarding significant connectivity took years to conduct. That is the nature of science. Most studies involved a relatively few wetlands, or were otherwise limited in their geographic scope while nevertheless providing some important, broadly applicable information, useful and applicable within the "weight of evidence" approach.

Against those scientific realities as a backdrop, the net result of the proposed rule is that it seems to place a heavy reliance on the "case-specific analyses" of "other waters." In the proposed rule's current form, it appears the vast majority of the surface area of the U.S. would fall within watersheds that would require case-specific analyses to determine jurisdiction for the multitude of wetlands occurring within these areas. Therefore, being aware of the staffing, budget, and other administrative constraints and realities that the agencies face today and anticipate for the foreseeable future, we must seriously question the pragmatism of some aspects of the proposed rule, particularly those related to "other waters." And in a related way, although science-based case-specific analyses may sound appealing in terms of their ability to be focused on specific wetlands, watersheds, and/or ecoregions, such science is both expensive and time-consuming, sometimes requiring years to conduct a scientifically sound and accurate analysis of a situation. We must again, therefore, question the practicality of a rule that would place an increasing emphasis on requiring these kinds of costly, time-consuming analyses for a high proportion of the Nation's waters within a regulatory framework that desires certainty, predictability, and administrative efficiency and timeliness.

Thus, as the agencies evaluate comments and develop the final rule, we strongly encourage them to place greater weight on this criterion of administrative and scientific "pragmatism." Later in our comments we will offer suggestions, such as *a priori* analysis based on existing science and using a "weight of the evidence" approach of major categories of "other waters" and ecoregions, that we believe will be not only more pragmatic to apply and administer, but will also go a long way toward providing significantly increased clarity and certainty for all stakeholders.

e. Is it consistent with the agencies' public statements that the new rule would not be an expansion of jurisdiction relative to existing regulations, and that the agricultural and ranching sectors, in particular, would not be subject to increased permitting requirements? It seems clear from the content of the proposed rule, the issuance of the special "interpretive rule" addressing conservation practices, the fact sheets released by the agencies, and the public comments made by the EPA Administrator and other top officials of the EPA and Corps of Engineers, that the desire of both agencies and the intent of the proposed rule is to preserve and even strengthen the statutory exemptions for normal farming, ranching, and silvicultural practices. Public statements have been made to the effect of, "if you didn't need a permit for your farming activities before, you won't need one under the proposed rule." Nevertheless, despite the agencies' efforts, it is clear that much of the agricultural community remains concerned that the new rule does not increase their level of clarity and certainty, would expand jurisdiction compared to the existing regulations, and could burden them with new or additional permitting requirements.

Relative to agriculture and ranching, this situation indicates the need for at least two things in the final rule. First, there is apparently a need for increased clarity to alleviate the concerns of the agricultural and ranching communities that the rule represents an expansion of jurisdiction and associated regulatory burdens. Similarly, the clear meaning of the rule must also be apparent to the thousands of individuals who work within the regulating agencies. Many farmers and ranchers are concerned that if not stated with sufficient precision, they may be subjected to a wide variety of interpretations of the new rule across the many Corp of Engineers districts and EPA regions.

For example, the production of rice is critical to the future of migratory populations of North American waterfowl, and plays an important role in contributing habitat needed by many other species. Approximately 3 million acres of rice is planted annually, primarily in the Lower Mississippi Valley, Central Valley of California, and Gulf coastal prairie regions. In the latter two regions, waste rice provides over 40% of the nutritional requirements of wintering waterfowl populations (Petrie et al. 2014). Without these food resources, important waterfowl and other wildlife conservation objectives would be unattainable.

Statements have been made by representatives of the agencies that the activities and jurisdictional issues related to rice producers would be completely unaffected by the rule. Nevertheless, some specific language of the proposed rule causes some concern among rice producers that, regardless of intent, potential interpretation of the wording could potentially bring what are currently non-jurisdictional rice fields and related infrastructure under the new definition of "waters of the U.S." These language issues must be resolved so that it is clear that those producers would not be subject to new or additional permitting or other restrictions associated with jurisdiction as "waters of the U.S."

Therefore, in light of statements and commitments made by the agencies that the new rule would impose no new jurisdiction or permitting requirements that would affect the longstanding statutory exemptions related to normal farming, ranching, and silvicultural practices, a criterion for finalizing the rule must be that they uphold and are fully consistent with the agencies' related public statements.

II. Comments on the "Proposed Definition of 'Waters of the United States'"

The structure and order of our detailed comments will generally follow the preamble of the proposed rule beginning with its section III, "Proposed Definition of Waters of the United States" (FR 22198). We find the "Summary of Proposed Rule" to be an accurate reflection of the more comprehensive treatment of each individual element covered in the preamble, so we will focus our comments here on the proposed rule's individual elements.

You will note, however, that we do not offer detailed comments on every aspect of the proposed rule. Our comments will strive first and foremost to be science-based, and to provide objective analysis of the potential or likely outcomes of proposals contained within the draft rule. We will also focus our comments primarily on those aspects of the rule for which DU has relevant expertise, experience and/or perspectives. Thus, we pay special attention to the components of the proposed rule that deal with "other waters" given that a large percentage of the Nation's remaining wetlands fall within that broad category of waters (as defined in the proposed rule). We place significant focus on the wetlands of the northern Great Plains, where literally millions of small prairie potholes are a key ecological component of the most significant waterfowl breeding area on the continent. We are aware that other organizations will be focusing comments on other subcategories of wetlands classed as "other waters" and ecoregions in which they comprise a significant feature of the landscape. We encourage the agencies to carefully review the comments it receives regarding all of these wetland systems because we know that significant aspects of the science related to one subcategory of wetland or another will be broadly applicable to many wetlands currently lumped into the proposed "other waters" legal category.

A. Traditional Navigable Waters, Interstate Waters, and Territorial Seas

We agree that, in light of the language of the Act and related judicial findings, these categories of waters should continue to be the foundation for assessing CWA jurisdiction. It is appropriate that the fundamental question of "significant nexus" for other categories of waters be viewed through the lens of assessing their impact on these (a)(1) through (a)(3) waters.

We do not find it explicitly stated, but we must presume that "interstate waters" would also include "international waters" based on the same reasoning used to categorically include "interstate waters" in this category of being jurisdictional by rule. If that is not the case, we would recommend that "international waters" such as rivers, wetlands, and other water bodies that are on the Canadian or Mexican borders with the U.S. or flow across the border between nations, also be expressly designated as jurisdictional. The same scientific facts and legal foundation should provide the basis for extending CWA protections to these international waters, as well.

Emerging Technologies and Jurisdictional Waters: We note the agencies' expressed interest *"in identifying emerging technologies or other 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."* Because traditional navigable waters, interstate waters, and the territorial seas ultimately provide the basis for designating by rule or assessing potential CWA jurisdiction for all other categories of waters, we strongly recommend that existing and readily available technology be used to map all (a)(1) through (a)(3) waters across the U.S. At the moment, it is extremely difficult if not impossible to find maps, even at the level of individual Corps districts, which clearly depict these waters. While there are limited maps available in some instances, and lists for some of these waters in some areas, there is by no means a cohesive, nationwide system of compiling and making this information available at this time. Some criteria for determining navigability, such as when *"a Federal court has determined that the water body is navigable-in-fact under Federal law,"* often involve protracted and complex court proceedings. These kinds of cases, in particular, often seem not to be transferred to readily available maps or other publicly available sources of information about waters that have been determined to be jurisdictional.

Therefore, a nationally coherent, readily available, searchable database and mapping system that depicts all the (a)(1) through (a)(3) waters could be one of the most important steps that could be taken to use technology to *"save time and money and improve efficiency for regulators and the regulated community."* Furthermore, in the event that certain components of the final rule generally conform to the proposed rule, such a geographic database should also include and depict all "other waters" that also have been determined to be jurisdictional by rule. For example, as the proposed rule stands, we would anticipate such maps and databases would include all tributaries, adjacent wetlands, and wetlands in floodplains. We understand that the satellite imagery and other technologies that would provide the basis for such maps are imperfect and incomplete. However, those issues would be manageable in light of the tremendous benefits that such a geographic database would provide to regulators and the regulated community alike.

Finally, as additional waters are found to be jurisdictional (e.g., via court cases regarding navigability-in-fact, findings of significant nexus in the case of individual or aggregated "other waters," etc.), those findings and decisions should be incorporated into the database.

Although not an "emerging" technology, existing technology related to mapping and geographic databases could and should be used to develop this valuable tool. It could be among the most important and achievable tools for streamlining information dissemination and speeding administrative processes, thereby providing significant and tangible benefits to both regulators and the regulated community.

B. Impoundments

We agree with and support the relatively minor, clarifying changes made with respect to the issue of whether or not impoundments fall within the definition of "waters of the U.S."

C. Tributaries

We agree with the agencies' statement that the literature "clearly demonstrates that streams, regardless of their size or how frequently they flow, strongly influence how downstream waters function." The preamble provides an excellent summary of the relationship between the synthesis of the science related to tributaries and the purposes of the Act, articulated as follows: *"One of the primary purposes and functions of the CWA is to prevent the discharge of petroleum wastes and other chemical wastes, biological and medical wastes, sediments, nutrients and all other forms of pollutants into the "waters of the United States," because such pollutants endanger the Nation's public health, drinking water supplies, shellfish, fin fish, recreation areas, etc. Because the entire tributary system of the traditional navigable, interstate waters or the territorial seas is interconnected, pollutants that are dumped into any part of the tributary system eventually are washed downstream to traditional navigable waters, interstate waters, or the territorial seas where those pollutants endanger public health and the environment."* Therefore, based on the science thoroughly reviewed in the draft Connectivity Report and in Appendix A, Scientific Evidence (henceforth, "Appendix"), the finding that all tributaries, as a class, have a significant nexus with and impact upon the physical, chemical and biological integrity of downstream (a)(1) through (a)(3) waters and are therefore jurisdictional by rule, is scientifically appropriate and sound.

However, related to the definition of tributaries, we agree with the recommendation contained in the EPA's Science Advisory Board's (SAB) letter to the Administrator (9/30/14) regarding the adequacy of the scientific and technical basis for the proposed rule as it relates to the definition of tributaries. The SAB's draft report "advises the EPA to reconsider the definition of tributaries because not all tributaries have ordinary high water marks [OHWM]," and that "an OHWM may be absent in ephemeral streams within arid and semi-arid environments or low gradient landscapes where the flow of water is unlikely to cause an OHWM." Noting the difficulty that has been experienced in some areas with application of the OHWM criterion, we agree with the SAB's recommendation that the wording of the definition of tributary be changed to "bed, bank, and other evidence of flow." In other respects, we generally support the definition of tributaries and find it to be in keeping with the related science.

In cases in which wetlands serve as water sources at the upper limit of the tributary system, or serve to connect two waters from among the other classes of wetlands considered jurisdictional by rule, we agree with the proposed approach of considering such wetlands as a "tributary" for purposes related to jurisdiction. The alternative approach of considering them "adjacent wetlands" would appear to achieve the same end result, but the proposed approach seems more efficient, particularly when considering the issue of classification of these waters for purposes of potential future database management.

<u>Treatment of "Ditches" Within the Tributary Class:</u> In general, we find the EPA's treatment of ditches scientifically sound and acceptable. For example, it is clear that a significant nexus to other jurisdictional waters would be provided by the four primary types of ditches that would remain jurisdictional by rule:

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

We accept the proposed definition and treatment of "upland ditches" as non-jurisdictional. This will help provide clarity and certainty to farmers, ranchers, and other landowners. We also agree that it is helpful to make it explicitly clear that, as the proposed rule states, excluded ditches cannot be "recaptured" under other provisions of the rule. Again in the interest of providing as much clarity and certainty as possible, we support the preamble's explicit inclusion of statements such as, *"ephemeral features located on agricultural lands that do not possess a bed and bank are not tributaries", "such farm field features are not tributaries even though they may contribute flow during some rain events or snowmelt*", and *"of importance with respect to tributaries is the exclusion of gullies, rills, non-wetland swales, and certain ditches.*"

We are aware that the issues of ditches, swales, gullies, and rills have caused concern among the agricultural sector. For example, the rice industry has expressed the concern that the changes made to the treatment of ditches and irrigation canals could bring these key on-farm infrastructural components of rice production within the new definition of "waters of the U.S."

Thus, the longstanding exemption for the agricultural drainage ditches and irrigation canals (enshrined within past regulatory practices, if not rule) needs to be made perfectly clear by the language of the final rule.

We encourage the agencies to consider any revisions to the definitions and language of the rule and preamble that help ensure its intentions with respect to these types of waters and artificial water conveyances, and the meaning and interpretation of the rule, are clear and precise to the public and to their own regulators.

D. Adjacent Waters

<u>Jurisdiction by rule for adjacent wetlands and other waters:</u> We agree with the agencies' finding, based on the weight of the scientific evidence presented in the Report and the Appendix, that adjacent waters such as riparian and floodplain waters *"significantly affect the chemical, physical, and biological integrity of (a)(1) through (a)(3) waters"* due to the existence of a significant nexus. The preamble of the proposed rule states the science-based conclusion that *"all adjacent waters should be jurisdictional by rule because the discharge of many pollutants (such as nutrients, petroleum wastes and other toxic pollutants) into adjacent waters often flow into and thereby pollute the traditional navigable waters, interstate waters, and the territorial seas."*

This conclusion is also consistent with the current legal framework and reflects Justice Kennedy's statement that *"the agencies' existing regulation "rests upon a reasonable inference of ecologic interconnection, and the assertion of jurisdiction for those wetlands is sustainable under the Act by showing adjacency alone."* And again, the Court in their *Riverside Bayview* decision stated that while *"not every adjacent wetland is of great importance to the environment of adjoining bodies of water,"* "*if it is reasonable for the Corps to conclude that in the majority of cases adjacent wetlands have significant effects on water quality and the ecosystem, its definition [of adjacency] can stand."* Thus, not only do these examples show that the Supreme Court supports a "weight of the evidence" approach to using and applying the underlying science, in each of these cases they do so in the context of adjacent waters. So, the agencies are on firm scientific and legal ground with respect to their categorical inclusion of adjacent waters as jurisdictional "waters of the U.S."

<u>Definition of "adjacent" should incorporate the concept of "functional adjacency":</u> However, we cannot agree with every aspect of the proposed rule as it treats "adjacent waters" because some appear to be inconsistent with existing science. The primary underlying concern we have, and which affects a number of individual aspects of the draft rule, is that it seems to consider adjacency almost wholly within the framework of physical proximity to the nearest jurisdictional water. This narrow view of adjacency may be administratively attractive in light of its simplicity, however it diverges too significantly from the underlying science to be acceptable in a rule that purports to be guided by the science.

We strongly encourage that, in light of the abundant related science, adjacency be viewed from the context of "functional adjacency." We were glad to see that the SAB in their September 30 letter to the Administrator articulated the same concern, stating that *"importantly, the available science supports defining adjacency or determination of adjacency on the basis of functional relationships, not on how close an adjacent water is to a navigable water. The Board also notes that local shallow subsurface water sources and regional groundwater sources* [emphasis ours] *can strongly affect connectivity. Thus, the Board advises the EPA that adjacent waters and wetlands should not be defined solely on the basis of geographical proximity or distance to jurisdictional waters."*

We advanced the concept of "functional adjacency" in some detail in DU's comments responding to the Advance Notice of Proposed Rulemaking in 2003 (Docket ID No. OW-2002-0050). The central issue now would be the recognition that adjacency, from the standpoint of the physical, chemical, and biological integrity, should not be viewed as being simply limited by physical proximity, but rather in terms of functional linkages. Thus, *functionally* "adjacent wetlands" can be physically distant from navigable waters (just as a jurisdictional surface tributary may be located many miles upstream of a navigable water), yet its direct functional linkage to (i.e., its significant nexus with) the waters of the U.S. for purposes of maintaining the integrity of the downstream waters would remain the central element of the jurisdictional decision.

For example, simulation of regional groundwater flow systems in Stutsman and Kidder counties, North Dakota, portrayed lateral movement of groundwater flow over 16 mi that discharge into Pipestem Creek (Winter and Carr 1980). As another example, Novacek (1989) stated that the sandhills and associated wetlands in Nebraska (including wet meadows) are important to water table and aquifer recharge, with the region containing five principal drainage basins that all ultimately empty into the Platte and Missouri rivers, thus creating a significant nexus between wetlands and navigable waters, even though the wetlands are not in physical proximity to the jurisdictional waters. This example demonstrates that this issue is not restricted to adjacent waters, but also carries over into the consideration of "other waters" and, in fact, is important in illustrating the scientific fact that "adjacent waters" and "geographically isolated" waters represent a continuum as opposed to a simple dichotomy.

A particularly interesting and relevant example of the significant nexus between physically non-proximate and traditional navigable waters is Nebraska's Platte River and its tributaries in Colorado (South Platte River) and Wyoming (North Platte), an area covering 23,000 sq. mi. The Platte River provides important habitat for four federally listed threatened and endangered species. Large amounts of surface water have been diverted from this river for irrigation and other purposes all along the system, and the effects of this diversion on the river have been significant enough to contribute to the Platte River in Nebraska occasionally running dry (e.g., in 2003).

As a consequence of the over-appropriation of water in the region, and the acceptance as fact that wetlands and other geographically isolated, non-adjacent waters in this region provide groundwater recharge that in turn provides base flow to these navigable rivers, artificial groundwater recharge sites and wetlands have long been used as a tool for replenishing river water (Warner et al. 1986; Watt 2003). Complex hydrologic models have been developed so that landowners and regulators can closely estimate how much water, and in what time frame, will be "delivered" to the river from a particular wetland or recharge site (Warner et al. 1986). Through contractual agreements supported by Colorado water law, and under the auspices of the interstate federal "Platte River Recovery Implementation Program Cooperative Agreement" signed in 2006, the water in this interlinked wetland/lake/groundwater/Platte river system is commercially exchanged on the basis of this well-established and scientifically demonstrated significant nexus. Notably, recharge wetlands and other sites are typically located a mile or more away from the river and would not be considered "adjacent" merely by virtue of proximity as proposed in the draft rule, as opposed to applying a functional perspective on adjacency. Some sites are much farther away. For example, the Fort Morgan recharge sites (Warner et al. 1986) and Brush Prairie wetlands/ponds are located 5-7 miles from the South Platte, and are credited with the capacity to recharge 13,000 acre-feet of water annually to the river. It is estimated that it takes five years for that water to move from the Brush Prairie wetlands to the South Platte River. Another project, the Little Bijou Reservoir, involves a distance of eight miles, requiring about 12 years for the water to move from the water body to the river. Regardless of the distance and time involved, however, this water is bought and sold and constitutes a significant component of the fiscal and water economy of the region, all based upon the accepted certainty of the functional connectivity and significant nexus that exists between the Platte River and waters that do not currently fit within the proposed definitions of adjacent merely because of the distance involved.

In addition, there are many examples in which a significant nexus is demonstrated between adjacent or "other waters" and jurisdictional waters, and is created via regional or deeper groundwater sources, not simply shallow subsurface water sources. For example, Tiner et al. (2002) indicated that most sandhill wetlands are interconnected with the local groundwater and the agriculturally important Ogallala, or High Plains, aquifer. Furthermore, Weeks and Gutentag (1984) stated that groundwater from this aquifer discharges naturally into flowing streams and springs, and that the aquifer and valley-fill deposits and associated streams comprise a stream-aquifer system that links the High Plains aquifer to surface tributaries of the Platte, Republican and Arkansas rivers. We will discuss this in more detail in our treatment of several regional wetland systems later in our comments.

The available science clearly shows then that, in many cases, the subsurface connections emphasized in the proposed rule's rationale for protecting physically proximate adjacent wetlands extends far beyond the short distance that the current definitions of "adjacent" and "neighboring" seem to imply, and that significant nexuses also exist via deeper groundwater connections in many cases. This not only underscores the need to look beyond distance in assessing adjacency from the scientifically more meaningful perspective of functional adjacency, but it also raises a temporal component to the question of adjacency, significant nexus, and the purpose of the Act. There is no question that physical proximity is an important component of adjacency, but distance should not override reasonable evidence of the functional connections that provide for a significant nexus. The fact that it may take longer for water to move through subsurface avenues from wetlands within a region to jurisdictional waters should not in itself disqualify these wetlands from being jurisdictional by rule as being adjacent. It should not matter whether or not an impairment to the physical, chemical or biological integrity of jurisdictional water would occur in a month, year, or even 10 or 100 years. If the significant nexus is known or can be reasonably inferred to exist based on available science, the integrity of the future downstream waters, not to mention the health and welfare of future citizens, should be protected now.

Thus, we believe that demonstrated linkages between wetlands, groundwater and navigable waters within a broad variety of wetland categories and across a diversity of landscapes and regions, indicate that adjacency and significant nexus should be interpreted from a functional perspective if the purposes of the Act and the welfare of our citizens are to be benefited. From that perspective, we strongly support the SAB's recommendation that the definitions associated with adjacent waters be revised to recognize the scientifically demonstrated functional relationships that provide for a significant nexus.

In that light, we are concerned about the agencies' statement that, *"a determination of adjacency based on shallow subsurface or confined surface hydrologic connection outside the riparian area or floodplain requires clear documentation."* For some areas, science exists to support the contention that these connections exist across broad areas including many wetlands. But, depending upon the scale of a jurisdictional decision, the information might not be considered by some regulators to rise to the level of "clear documentation." Furthermore, and again depending upon the application of such a direction for "clear documentation," this requirement may go beyond Justice Kennedy's expectation that the regulation *"rests upon a <u>reasonable inference</u>* [emphasis ours] *of ecologic interconnection."*

At the same time, we recognize that there are some ecoregions or landscapes in which the soils, geology, and other characteristics would lead to the reasonable inference that even functional adjacency would not extend very far from the jurisdictional water. This variability in the relationship between distance and the reasonable inference of a significant nexus provides another indication of the benefits of doing *a priori* significant nexus assessments of at least some of the Nation's key ecoregions. These *a priori* analyses would allow identification, by rule, of those ecoregions for which a presumption of significant nexus between its wetlands, in the aggregate, and other jurisdictional waters would be reasonable, and thereby in turn provide a greater degree of clarity, certainty, and predictability regarding CWA jurisdiction within those landscapes. We will address this suggestion in more detail in our treatment of "other waters" to follow.

Definitions of "neighboring," "riparian," and "floodplain": We agree with the general goal of categorically incorporating riparian and floodplain waters as jurisdictional "adjacent waters" within the definition of "neighboring." The science is strong in terms of indicating that riparian waters almost universally have a significant hydrologic connection and nexus with the jurisdictional waters that are usually adjacent, in the sense of both physical and functional proximity. In addition, we find the definition of "riparian area" to be simple, direct, and clearly science-based. We would expect relatively little debate over "riparian areas" while recognizing the reality that the field delineation of the borders of such areas will inevitably involve the application of expert judgment and some degree of variability.

The preamble makes the statement that, *"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.'"* In addition, it states 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. 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."*

This language raises the question of whether it is the intention of the agencies to consider under "neighboring," wetlands and waters such as those mentioned above in the discussion related to the Platte River, or freshwater wetlands along the Gulf Coast of Texas and Louisiana that have shallow subsurface connections to waters like the Gulf and that can extend many miles inland. However, other language in the preamble seems to indicate that even though such wetlands fit within the definition of "neighboring," they would nevertheless be excluded from the definition of "adjacent" due solely, in spite of the functional connection, to their distance from the jurisdictional water. For example, it states: *"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."*

Thus, these relationships and definitions require clarification given some apparent inconsistencies among them and conflicts with some important aspects of the science that supports the existence of a significant nexus. Again, *a priori* ecoregional assessments could greatly increase clarity and certainty, as well as greatly streamlining administration of the Act because wetlands in some landscapes (including but not limited to the above-cited Gulf Coast, Platte River and tributaries region, and similar circumstances) that are situated far beyond the floodplain or riparian area could be determined to be "neighboring" by virtue of functional adjacency and the significant nexus via subsurface connectivity. They could thus be designated as jurisdictional by rule, therefore obviating the need for many time-consuming and costly case-specific analyses. The available and emerging science in many systems strongly supports such an approach.

With respect to "floodplains," we find the definition scientifically reasonable but perhaps less clear than it could or should be. We note the reference to *"formed by sediment deposition from such water under present climatic conditions…."* We must assume that "climatic" in this definition was carefully selected on the basis of its science-based meaning, and that "current land use conditions" would not be used synonymously. Recent changes to the landscape, including levee construction and extensive land use change, have in many cases changed the height and frequency of flooding in and around many historic floodplains.

We further believe that while the seemingly heavy reliance on "best professional judgment" might lead to reasonable determinations in most cases, the situation for determination of the floodplain as described in the preamble leaves the regulated community very much in the dark. The definition of floodplain, or at least the intended administrative treatment of what constitutes a floodplain, requires additional treatment to provide greater clarity and certainty to the public, and better guidance to the many regulatory staff that the agencies have distributed across the country and who will be applying the rule to actual circumstances in the field.

We note reference to *"10 to 20 year flood interval zone"* in one spot, and we would consider that relatively high frequency flood zone as being too narrow to reflect the actual floodplain in many if not most circumstances. In light of the definition's use of the phrase, *"is inundated during periods of moderate to high flows,"* we would expect something more on the order of 100 years to be a more reasonable approximation of "high flows," especially given the increasing frequency of large floods in many areas and the increasing costs to society that are incurred in conjunction with these floods.

However, we also recognize that maps of flood zones do not exist for many, if not most, areas of the country outside urban and suburban areas. That being the case, we would suggest considering the use of more objective, science-based surrogate criteria such as soil classifications. The soils associated with the floodplain would certainly not be restricted to hydric soils, but given the definition's reference to the central element of *"sediment deposition,"* we suggest there are elements of soil and/or geologic characterizations that could serve as a surrogate for helping to narrow the understanding and/or definition of floodplains for purposes of this rule.

Related Agricultural Issues: The above comments notwithstanding, it should be made more clear that, as a result of the longstanding exclusions of rice fields from jurisdiction, the interpretation of adjacency will not result in the extension of jurisdiction to rice fields. While we sometimes refer to rice fields as "surrogate wetlands" in recognition of their wetland-related ecological functions, ranging from habitat for waterfowl and other migratory birds to improvements of water quality, that they often provide, rice fields are nevertheless not "wetlands" and therefore should not be regulated as such. Although a science-based case for adjacency could be argued in some cases, the longstanding exemption of rice fields must be clearly preserved by the final language of the rule.

In the same vein, the exclusion of "artificial lakes or ponds created by excavating and/or diking dry land and used *exclusively* [emphasis ours] for such purposes as stock watering, irrigation, settling basins, or rice growing," should be modified. Many of the artificial reservoirs used for rice agriculture, for instance, serve additional, ancillary purposes such as waterfowl hunting. These water bodies, whose primary use is clearly to provide agricultural irrigation water and which have not previously been regulated, should not now be brought under the jurisdiction of the new rule because there are often secondary uses of that water. We leave it to the agencies to work with the agricultural sector to develop suitable wording to address this concern.

E. "Other Waters"

The proposed rule classifies all waters falling outside the categories discussed above as "other waters." By virtue of being defined at a national level, "other waters" includes wetland types as diverse as the prairie potholes of the Northern Great Plains, Gulf Coast freshwater prairie wetlands, playas, and alvar wetlands of the Great Lakes region, among many others. As currently defined, "other waters" includes a significant percentage of the Nation's remaining wetlands across the country as a whole. In some areas, such as the Prairie Pothole Region, they constitute the vast majority of the waters of the region and comprise a dominant component of the landscape.

We cannot agree with the proposed jurisdictional treatment in the draft rule of "other waters" in light of the strength, abundance, and diversity of the available and rapidly growing scientific literature that sheds light on the significant nexuses that exist between many of these wetland categories and "waters of the U.S.", or given the language and rationale contained in Justice Kennedy's ruling viewed in concert with other judicial decisions. We believe the regulatory presumption that all "other waters," across the entire U.S., lack a significant nexus with traditionally navigable waters, interstate waters, or the territorial seas, and therefore have no impact on the integrity of these waters, is an inappropriate presumption in the face of the abundant science available. To make this presumption is to willfully exclude waters that science clearly demonstrates have a significant impact upon downstream waters and therefore will result in degradation of the chemical, physical and biological integrity of the Nation's waters, and expressly run counter to the fundamental purpose of the Act.

While we certainly understand that not all "other waters" possess the significant nexus required by the judicial rulings, our reading of the science indicates that more likely do have such nexuses than do not. We strongly suggest that during the finalization of the rule, the agencies evaluate these "other waters" on an ecoregional basis and, based on the available science and judgments of wetland and hydrologic experts, determine for which regions of the country the wetlands that exist therein should be designated as jurisdictional by rule. The special SAB panel on connectivity appears to agree that the available science supports such an approach, and the SAB's September 30 letter explicitly states that, *"There is also adequate scientific evidence to support a determination that certain subcategories and types of "other waters" in particular regions of the United States (e.g., Carolina and Delmarva Bays, Texas coastal prairie wetlands, prairie potholes, pocosins, western vernal pools) are similarly situated (i.e., they have a similar influence on the physical, biological, and chemical integrity of downstream waters and are similarly situated on the landscape) and thus could be considered waters of the United States. Furthermore, as the science continues to develop, other sets of wetlands may be identified as "similarly situated."* Our comments will examine the circumstances and science related to a few such regions, including related science from other regions that we believe is broadly applicable to the regions in question, putting particular emphasis on the Prairie Pothole Region of the northern Great Plains.

First, however, we will provide some comments and evaluation of the other critical components of designating "other waters" as having a significant chemical, physical, or biological relationship to downstream navigable waters.

<u>Relationship to Downstream Waters:</u> The draft rule currently proposes that the required significant nexus of an "other water" (assume that our use of this phrase considers that to also include "in the aggregate" and in most cases not simply a single wetland) must be demonstrated with and (a)(1) through (a)(3) water, i.e., a traditionally navigable water, interstate water, or territorial sea. However, we believe that the science supports our recommendation that this should include (a)(4) and (a)(5) waters (i.e., tributaries and impoundments of such waters), as well. Under the proposed rule, and as strongly supported by the available science, the entire tributary system is considered to be a "water of the U.S." Thus, it is not clear to us, and seems to defy a science-based rationale, as to why a significant nexus between "other waters" and a tributary that is a "water of the U.S." by rule due to its direct impact on a traditionally navigable water, is any less significant than that of an "other water" that is demonstrated to have a significant nexus directly with the navigable water. If such a significant nexus exists, whether it is with the traditionally navigable water or with its tributary, the net effect is the same in both cases – the significant nexus affects the integrity of the navigable water.

We therefore recommend that when case-specific analyses of "other waters" are conducted, the required significant nexus should be able to be applied to any categorically designated "water of the U.S." This would include not only (a)(1) through (a)(3) waters, but also include at least (a)(4) and (a)(5) waters. As the situation with regard to waters that will be "waters of the U.S." by virtue of their adjacency is further clarified, the final class of (a)(6) waters should likely also be included as a potential avenue of demonstrating significant nexus.

Finally, given the pivotal importance of the classes of waters that will ultimately be required to be used to evaluate significant nexus, this situation further underscores the importance and necessity of having a comprehensive, standardized, and publicly available database that allows the regulated community to determine the location of the nearest such water. The creation of such databases and/or maps would significantly increase the ability of the regulated community and regulators to first determine if a permit is necessary, and then to work through the permitting process in a timely fashion. These tools would significantly increase the efficiency of the entire process of administering and complying with the Act.

<u>Application of the "significant nexus" test:</u> In light of Justice Kennedy's opinion and other related judicial decisions, we understand and acknowledge the requirement that only those waters that either alone or in the aggregate have a significant relationship with downstream navigable waters can be considered to be "waters of the U.S." and therefore be included within the jurisdiction of the CWA. Thus, we understand that waters not falling within the (a)(1) through (a)(6) categories will, at some point or another, need to be subjected to a case-specific significant nexus analysis.

However, one of the most important recommendations contained within these comments, to which we have alluded previously, is that *a priori* case-specific analyses should be conducted by the agencies for major subcategories of "other waters" as a part of finalizing the rule. Then, in cases where a significant nexus is either demonstrated or found to be a reasonable presumption based on the weight of the scientific evidence, the wetlands and other waters within these landscapes (e.g., ecoregions), would be determined to be jurisdictional by rule. Because of (1) the work that has already been done with respect to compiling a massive amount of the literature in conjunction with the drafting of the Connectivity Report, (2) the multiple levels of reviews to which the Report has been subjected, (3) the additional science that has been contributed by the special SAB panelists and the public during the review periods, (4) the science and analyses that will be provided to the agencies as a part of this comment period on the proposed rule, and (5) the increased attention being paid to the related emerging literature, the agencies are uniquely situated to move ahead right now, as a part of finalizing this rule, with these significant nexus analyses as a part of the rulemaking process. Such an approach offers a number of advantages and we believe contributes significantly to helping advance several of key objectives articulated by the agencies:

- By conducting these analyses of "other waters" that exist across broad landscapes, the designation of these waters as "waters of the U.S." by rule, where supported by the science, would provide much greater clarity and certainty for all landowners and regulators within those regions.

- Those regions for which a finding of significant nexus was warranted and its waters declared jurisdictional by rule would not have to be subjected to future case-specific analyses, thereby reducing the future administrative burdens associated with the rule. The reliance on time and resource-intensive, case-specific analyses could therefore be significantly reduced.
- The description of these regional significant nexus analyses and the associated findings would provide a tangible demonstration of the agencies' view of how these analyses should be conducted, and the sufficiency of science required to support a finding of significant nexus. They would therefore serve as model for the agencies' districts and regions, for the regulated community, and for scientists interested in conducting the research necessary to provide information key to future analyses and/or re-analyses.
- This approach acknowledges the diversity among categories of "other waters" across the U.S., and the fact that the body of science that currently exists clearly supports findings of significant nexus in some regions, but may not currently support such findings in other regions.
- The nature of science is that it builds upon itself over time, and this approach would begin the process of building a science-based "case law," so to speak, relative to the science and practice of assessing significant nexus as it relates to "waters of the U.S." Determinations of significant nexus could be documented and accumulated within a database and on maps that would significantly contribute to the efficiency of CWA administration and compliance, and increase clarity and certainty across the nation over time.

Given the breadth and depth of the science and scientific expertise currently at the agencies' disposal with respect to this issue, and the significant degree to which it would benefit several key objectives of the agencies as well as desires and concerns of the public, we therefore strongly encourage the agencies to conduct significant nexus analyses across key landscapes for the purposes of identifying those landscapes whose "other waters" should be designated as "waters of the U.S." by rule based on the existing science. We note and acknowledge, however, that such analyses cannot and will not assert jurisdiction as broadly as do the existing regulations. Nevertheless, this would represent a significant step in providing CWA protections to those waters that meet the scientific and legal thresholds required by recent judicial decisions.

In regard to all significant nexus analyses, conducted either *a priori* or after finalization of the rule, we strongly agree with the SAB's statement in their letter: *"The Board notes, however, that the science does not support excluding groups of "other waters" or subcategories thereof."* In other words, if the science currently available is not considered in certain cases to be sufficient to support a finding of a significant nexus at this time, it does not mean that such a nexus does not exist. Future science could emerge that could clearly demonstrate such a nexus. Thus, the lack of a significant nexus finding should not be the basis for placing such waters into the category of being permanently excluded from jurisdiction. However, for operational purposes, they would clearly remain non-jurisdictional unless a significant nexus finding was warranted by future analyses with additional scientific support.

<u>Definition of "Significant Nexus":</u> We agree that in light of Justice Kennedy's opinion, there is a need to define the phrase, "significant nexus," to the extent possible. We re-iterate the concern we raised in our July 20, 2011 comments on the previously proposed (and subsequently withdrawn) revised guidance (Docket ID No. EPA-HQ-OW 2011-0409) about the differences in the language of science and the law, and the very divergent perspectives that can arise over terms such as "significant," "speculative," and "could," among others. We are glad to see this issue of the language of science and the law explicitly raised in Appendix B, Legal Analysis (FR 22262). It will be important to keep this in mind as definitions and the remainder of the important substance of the rule is finalized to address the kinds of issues that we raise in our comments.

With respect to the specific definition of "significant nexus," we note and appreciate the legal thinking behind the agencies' close adherence to Justice Kennedy's language. However, it must be understood that his language on a fundamentally scientific question is being offered from within a legal context and by a justice, not a scientist. We have no issue with the definition's inclusion or reference to Kennedy's key language, but we recommend that the final rule go further in terms of explaining with more clarity how his language should be used in the science-based context of the analyses of connectivity that will be conducted for "other waters." Furthermore, we refer again to the fact that his opinion contains additional language (see quotes cited previously herein) that can and should inform the translation of his efforts to describe his legal perspective on a scientific topic into a more meaningful, science-based final rule for the scientists, managers, and others who will be charged with assessing whether or not a "significant nexus" exists.

The SAB September 30 letter to the EPA recommended that *"the EPA clarify in its general communications and in the preamble to the final rule that "significant nexus" is a legal term, not a scientific term."* We agree with this statement and recommendation.

Looking ahead, it is perhaps here that the agencies could more thoroughly explain how a "weight of the evidence" approach, for example, could or would be used in the context of significant nexus analyses. The definition (and/or related preamble language) could provide even more guidance with greater clarity regarding to what extent various components of the science related to wetland functions, such as water storage, nutrient transformation, and maintenance of base flows, can be generalized and reasonably applied to analyses of ecoregions and/or watersheds outside the one in which a particular piece of research was conducted, as Justice Kennedy indicated was acceptable in at least some contexts. The agencies should build upon the definition of "significant nexus" that is currently in the proposed rule so that it not only conveys the legal perspective on the term, but also provides some additional guidance with respect to the science-based analyses that will be required in order to satisfy the legal issues.

We note many positive aspects of the preamble language regarding the types of hydrologic, chemical, physical, and biological connectivity that are relevant to a significant nexus determination. We especially support the comments regarding application of regional and national studies to waters occurring elsewhere, where appropriate. This is important given the rapidly emerging state of the science of connectivity.

Some of our concerns stem in part from two seemingly conflicting messages in the proposed rule regarding the agencies' intent with respect to these analyses and the use of related science. On the one hand, the explanatory language seems to offer what is scientifically sound, helpful guidance with respect to the analyses of "other waters" for significant nexus. However, on the other hand, there are broad geographic swaths of subcategories of "other waters" that, at least in the current form of the proposed rule, would not be jurisdictional by rule. These would therefore be required to be subjected to case-specific significant nexus determinations in spite of the seemingly strong, broadly based scientific information that indicates that a significant nexus for these waters clearly exists, including subcategories of "other waters" which the EPA's SAB and special panel of experts on connectivity agree possess, in the aggregate, the required significant nexus. Thus, this situation offers additional rationale for proceeding with as many *a priori* significant nexus determinations of ecoregions, watersheds, or other suitable landscapes as is reasonable based on the available science, and designating jurisdictional by rule those waters that satisfy the agencies' significant nexus evaluation.

Regarding the question of whether or not a nexus is "significant," the agencies should consider the range of pollutants (or fill) that could be deposited in a non-jurisdictional wetland and their potential impacts on the integrity of downstream waters, as well as health and human welfare. For example, deposition of soil into a single isolated wetland, such as one that might be located miles away from the South Platte River as described earlier, might be deemed to have an "insubstantial" impact on the navigable waters. Infiltration would be impacted and a decrease in the base flow would result, for example. If there were no other wetlands suitable for contributing to an aggregate analysis, this could be a situation in which the nexus was considered insubstantial. However, if instead of soil a water soluble toxic chemical were to be deposited in that same wetland, in a few years the water carrying the compound would have moved through the groundwater and be discharged into the river, ultimately causing serious degradation of the chemical and biological integrity of a navigable "water of the U.S." This is but one illustration of the kinds of possibilities that will inevitably be encountered, and therefore should be considered when evaluating the "significance" of a nexus.

An actual example can be used to even better illustrate that point. The ongoing events involving the spill of an estimated 5,000-7,000 barrels of crude oil spill that occurred in the small town of Mayflower, Arkansas in March 2013 demonstrate this kind of scenario, and the associated potential legal ramifications of failing to identify the existence of a significant nexus and designating jurisdiction when such a nexus indeed exists. Some of the crude oil that spilled as a result of a ruptured Exxon pipeline flowed into wetlands and inlets adjoining Lake Conway, a popular fishing and recreational lake surrounded by homes and cottages. Some media reports (http://arkansasnews.com/news/arkansas/judge-won-t-toss-joint-state-federal-lawsuit-over-mayflower-oil-spill) state that Exxon's defense includes the assertion that the State Attorney General failed to show that "rupture of the Pegasus pipeline polluted navigable waters." Thus, at least a portion of the company's defense regarding their legal responsibility for damages to the integrity of the associated water bodies apparently hinges on whether or not the waters were jurisdictional, in spite of the observed connections and impacts. This is just one example of the potential consequences stemming from the interpretation of "significant" and the results of future significant nexus analyses.

Interpretation and Application of "Similarly Situated" to Significant Nexus Analyses: Although we strongly agree with and support evaluation of wetlands and other waters in the aggregate when conducting most case-specific analyses, we are concerned about the landscape scale and type of aggregation proposed and described in the preamble. First, with respect to "similarly situated," we recognize the importance and benefits of hewing closely to Justice Kennedy's language, but we again caution that in this case his somewhat casual use of that phrase in the context of a Supreme Court opinion may be being given unintended weight in the context of developing the science-based processes that will be needed to administer a new rule.

For example, the preamble states that, *"other waters, including wetlands, are similarly situated when they perform similar functions and are located sufficiently 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 paragraphs (a)(1) through (a)(3). This combination of functionality and proximity to each other or to a "water of the United States" meets the standard provided by Justice Kennedy. Examining both functionality and proximity also limits the "other waters" that can be aggregated for purposes of determining jurisdiction."* We suggest that Justice Kennedy, in the absence of additional clarification, more likely simply intended the phrase to mean something along the lines of "located in the same region," as opposed to having thought about the variety of functions that wetlands provide, and the variability among individual wetlands with respect to those functions that the proposed rule appears to seek to address. It seems to us, looking at Justice Kennedy's opinion more holistically, it is more likely the simplest interpretation is the most likely, i.e., that he simply meant "located in the same region" (leaving it to the agencies to define the appropriate science-based scale for "region").

Most wetlands in an appropriately sized and delimited "region" will generally perform many of the same functions to one level or another. We understand that lentic and lotic systems can differ substantially and that these kinds of waters would not be considered "similar." However, virtually everything encompassed by lotic will already be jurisdictional by rule.

In cases, perhaps, it might be fully appropriate to separate deepwater habitats from wetlands within the lentic classification. Overall however, we believe that a scientifically valid and more efficient method of aggregating wetlands falling within the classification of "other waters" would be to evaluate them all in a simple, direct, comprehensive aggregation within the appropriate region.

Furthermore, we do not see the reason for injecting wetland density or proximity to a "water of the U.S." as criteria for qualifying as being "similarly situated" for purposes of being evaluated "in the aggregate" for a case-specific significant nexus evaluation. We certainly understand that functionality, proximity, and density would all be important factors in assessing whether or not the waters in question actually possess a significant nexus with "waters of the U.S." that is scientifically appropriate and necessary. However, those factors need not be introduced into the determination of which wetlands within a region qualify as being similarly situated, thereby qualifying for aggregation. We believe that what should be a more science-based element of the proposed rule, based on a subjective interpretation of Justice Kennedy's language by the agencies, goes well beyond what he intended, assuming that the appropriate sized and delimited "region" would be used to define the boundaries within which the wetlands would be considered "similarly situated." This kind of approach would be much clearer, simpler and efficient to administer than the current more complex approach outlined in the proposed rule.

<u>Interpretation and Application of "In the Region" to Significant Nexus Analyses:</u> As indicated above, the delineation of the scale of the region to be used for case-specific analyses is one of the most far-reaching aspects of the rule relative to "other waters." This is critical to the scientific validity of the analyses, the appropriate scope for aggregating similarly situated wetlands, and the degree to which the integrity of the "waters of the U.S." is maintained and restored, among other things. Perhaps most important to many, and to the rule's ultimate success, is that the scale of "in the region" will in large part be responsible for determining the efficiency, clarity, and certainty of the administrative processes associated with the rule and the Clean Water Act more broadly.

We agree with aggregating wetlands for a significant nexus analysis at the scale of the single point of entry watershed to the nearest (a)(1) through (a)(3) watershed, at the minimum. The rationale articulated in the preamble for starting at this watershed level makes sense, and has a good scientific basis. And, as we stated above, it would be most efficient and supported by the science to consider all the waters, at least within the wetland class, in the aggregate. Again, given the range of functions provided across a variety of wetland types located within the same watershed or ecoregion, there will generally be more overlap and similarities among them than there will be differences. That being the case, and in light of the above discussion regarding Justice Kennedy's legal language applied to a more scientific context, we fail to see a good, science-based rationale for attempting to separate types of wetlands existing in the "other waters" class within a particular watershed when in fact most will exist at somewhere along a continuum relative to a number of functions.

However, as we stated, we believe that the single point of entry watershed should be the minimum scale for evaluating similarly situated wetlands in the aggregate. We believe that there are many instances in which a watershed at this scale, upon review of its many characteristics related to topography, soils, land use, and the many other physical, chemical and biological characteristics reflected in the watershed's wetlands and other water bodies, will be very similar, and in some cases almost indistinguishable, from neighboring watersheds (see Lorenz et al. 2010). For example, there are a number of single point of entry watersheds that are lined up north to south along the Red River of the North between North Dakota and Minnesota and that exhibit strong similarities in almost every respect. When a need for case-specific analyses of "other waters" arises in circumstances such as this, it would seem to be consistent with the science and also administratively expeditious to first briefly review neighboring watersheds to determine if they are similar enough to the one in question to warrant an aggregation of more than one watershed into the analysis. There are numerous such examples of single point of entry watersheds that would be sufficiently similar, ecologically and hydrologically warrant being grouped together.

Therefore, combining adjoining watersheds to the extent scientifically appropriate and justifiable would lead to greater administrative efficiencies, and perhaps actually strengthen the results and validity of the scientific evaluation of significant nexus. Importantly, it would also more quickly provide a greater level of clarity and certainty to those affected by the rule across the broader geographic area of aggregated watersheds that simply expand upon an appropriate aggregation of waters. Of course, if neighboring watersheds were deemed, for science-based reasons, to be sufficiently different than the one in question, such aggregation of watersheds would not be appropriate.

F. "Other Waters" that Should be Evaluated for Being Jurisdictional by Rule:

The preamble requests public comment on a number of other specific aspects of the proposed rule, potential alternatives, and general issues associated with "other waters." As we address some of these, we note that the Report states that, *"science shows that tributaries and adjacent waters play an important role in maintaining the chemical, physical and biological integrity of traditional navigable waters."* We must also comment that the same is true for a great many "other waters," perhaps most if we only had complete knowledge available to us at this time. We do not, of course, have complete knowledge but the existing body of science indicates that we already know enough to accurately apply this statement to many subcategories of "other waters." The preamble to the proposed rule also states that, *"a growing body of scientific literature, as well as the agencies' growing body of scientific and technical knowledge and field expertise, led the agencies to conclude that it is reasonable to establish certain categories of waters that are jurisdictional by rule as they have a significant nexus to jurisdictional waters."*

We agree, and this applies to some significant categories of wetlands in various regions across the U.S.

We are particularly interested in providing comment addressing the specific issue raised in the preamble of whether the universally desired increase in clarity, certainty, and predictability could be advanced by *"determining that additional waters should be jurisdictional by rule."* The related question is whether the agencies could rely less on case-specific analyses through such an alternative, also thereby increasing efficiency.

As stated previously, we strongly believe that the breadth and depth of the available science, and the unique position of the agencies at this time, warrants conducting significant nexus analyses for wetlands, in the aggregate, for a number of significant regions of the country to determine which regions contain wetlands that could be designated as being jurisdictional by rule with a positive finding of significant nexus.

We disagree, however, that wetlands in other regions would necessarily have to "be determined to not be similarly situated." Some ecoregions, for example, could contain a wide diversity of landforms, range of altitudes, and other geologic and climatic attributes and could indeed include a broad range of wetland types that could not reasonably be considered to be "similarly situated." In such cases, a single point of entry watershed would perhaps be the best approach. However, other ecoregions might simply contain a lower density of wetlands, but they could very well be relatively similar in terms of their type, functions, and distribution across the landscape. The wetlands, in the aggregate, in some of these kinds of ecoregions might fail to rise to the level of being found jurisdictional by rule. However, given that the relevant science continues to emerge, these wetlands could in the future be found to be jurisdictional as a result of a case-specific significant nexus analysis. Therefore, those wetlands should by no means *"be determined to be not similarly situated"* if not included as jurisdictional by rule, and as a consequence have future case-specific analyses unnecessarily constrained in a way that could potentially eliminate any role for emerging science. We do agree that the *a priori* analyses of ecoregions would have to consider the variability across the regions and the extent to which each has "distinguishing factors."

The preamble contains a series of questions related to the issue of where and how to apply aggregation such that the "other waters" in some regions would be considered together for a case-specific analysis, or considered as individual wetlands. We strongly suggest that unless there are clear ecological regions for separating wetlands within the landscape under consideration, aggregation should be the rule. A predominance of case-specific analyses of "other waters" would tend to maximize uncertainty, unpredictability, and the regulatory burdens on both regulators and the regulated community. Every scientifically and legally justifiable reason to support aggregation should be explored before resorting to case-specific analyses of individual wetlands.

The selection and use of the appropriate scale of regions for these analyses is a critically important part of the scientific rationale for taking the above approach to aggregation. Careful selection and application of the appropriate scale for analysis of the "other waters" in each geographic unit helps:

- ensure a scientifically valid scale is consistently applied across all areas of the country;
- ensure each area's topography, geology, climatic conditions, soils and other physical, chemical, and biological features are reasonably similar;
- ensure the scale minimizes the diversity of "other waters" within its boundary and thereby supports aggregation of these waters for significant nexus analyses;
- promote regulatory clarity, certainty, and predictability across reasonably broad but scientifically valid landscapes; and,
- ensure the final rule is pragmatic to understand and administer, while remaining consistent with the available science and case law.

We agree with the agencies' suggestion that Level III ecoregions as described by Omernik (2004) represents the most appropriate scale for such analyses. Omernik articulated the need for and benefits of a more common geographic framework for management purposes, and described the accepted scientific basis for these geographically distinct landscapes. An indication of their widely accepted scientific validity is that Level III ecoregions have increasingly been adopted as the basis for science-based geographic systems for managing a variety of natural resources (e.g., the development of Bird Conservation Regions [NABCI 2001]). A review of the map of Level III ecoregions shows the contiguous U.S. is divided into 85 such regions, and combined with our knowledge of and field experience with many of the key wetlands areas contained within these ecoregions, they appear to be an appropriate scale for retaining strong scientific validity while contributing to a more pragmatic rule.

In the context of the proposed rule, the agencies should also note that Omernik (2004) and McMahon et al. (2001) articulate a strong rationale for using a "weight of the evidence" approach, which is qualitative in nature but founded on collective expertise, over a more rule-based or quantitative approach to ecoregion definition. We suggest that the rationale they provide for the weight of the evidence approach is directly applicable to some of the overarching issues and challenges that the agencies face in formulating a final rule. The rule must be clearly based on the available science and consistent with case law while at the same time being pragmatic to apply and protective of the integrity of the Nation's water resources as mandated in the Act, while cognizant of the limits imposed by case law.

Therefore, we agree with and strongly support the use of Alternative 1 (FR 22215), *"determine by rule that 'other waters' are similarly situated in certain areas of the country."* For reasons articulated previously, the agencies should proceed with *a priori,* science-based significant nexus analyses of the selected, high-priority regions, and the waters in those ecoregions in which a significant nexus was found for wetlands in the aggregate should then be designated as jurisdictional by rule.

After reviewing the list of ecoregions proposed as being potentially suitable for such analyses (FR 22215), we concur with the list of 25 regions as a good starting point. Clearly, priorities should be established so that those ecoregions containing well-known, important wetland systems would be examined first. The SAB September 30 letter to the EPA states that, *"there is also adequate scientific evidence to support a determination that certain subcategories and types of 'other waters' in particular regions of the United States (e.g., Carolina and Delmarva Bays, Texas coastal prairie wetlands, prairie potholes, pocosins, western vernal pools) are similarly situated (i.e., they have a similar influence on the physical, biological, and chemical integrity of downstream waters and are similarly situated on the landscape) and thus are waters of the United States."* We agree with this statement, and the wetland systems listed therein include the following Level III ecoregions, which should therefore be priorities for significant nexus analysis in the aggregate:

- 6 – Central California Foothills and Coastal Mountains
- 7 – Central California Valley
- 9 – Eastern Cascades Slopes and Foothills
- 34 – Western Gulf Coastal Plain
- 42 – Northwestern Glaciated Plains
- 46 – Northern Glaciated Plains
- 47 – Western Corn Belt Plains
- 48 – Lake Agassiz Plain
- 63 – Middle Atlantic Coastal Plain
- 65 – Southeastern Plains

Of particular interest to Ducks Unlimited is the area traditionally known as the Prairie Pothole Region, which is contained within ecoregions 42, 46, 47, and 48. We will provide a detailed review of some of the science for this region, as well as a few others, later in our comments. One of those will be the Nebraska Sandhills (ecoregion 44), which contains the sandhills wetland system, an area for which we suggest the science also supports a finding of significant nexus. We therefore recommend that ecoregion 44 be added to the above list of the highest priority ecoregions.

We further suggest that the agencies consider adding several ecoregions to the larger list of 25 on FR 22215:

- 25 – High Plains: This ecoregion contains the South Platte and portions of the Platte River system that we referenced earlier as containing wetlands and other waters that are known to have shallow, subsurface connectivity with the rivers, and that are being managed to augment maintenance of base flows in the rivers to benefit four federally listed threatened and endangered species as well as maintaining water supplies for irrigation and other interests.

- 53 – Southeastern Wisconsin Till Plains: This ecoregion, and the three that follow, adjoin the Great Lakes. In light of the high priority of these interstate/international waters, and the level of concern generated by an increasing number of high profile algal blooms and their relation to public health and welfare as well as economic impacts, we suggest that these Great Lakes ecoregions be added to the list.
- 56 – Southern Michigan / Northern Indiana Drift Plains
- 57 – Huron / Erie Lake Plains
- 61 – Erie Drift Plain
- 73 – Mississippi Alluvial Plain: This region was historically highly significant in terms of its wetlands and their importance to the Mississippi River and major tributaries. A significant amount of wetlands remain there, although most would likely be captured within the definition of riparian areas and adjacent waters. However, the remaining "other waters" in this ecoregion would most likely be considered similarly situated, and therefore suitable for a significant nexus evaluation in the aggregate.

All of the factors listed (FR 22216) as being used to develop the list are suitable science-based factors that appropriately relate to the primary question of significant nexus. However, we note that the list contains no reference to biological factors. This is of some concern because the EPA's original draft of the Connectivity Report, and this proposed rule, both seemed to minimize the biological component of the integrity of the Nation's waters. This was also pointed out by the SAB's special panel on connectivity. We will highlight a situation in our detailed treatment of the Texas Prairie Coastal Wetlands that is a biologically based example of connectivity that is fully consistent with the scientific and legal requirements for significant nexus. Thus, we recommend that a biological factor should be added to the list proposed by the agencies.

We do not agree with the second portion of alternative 2 (FR 22216), which would result in the "other waters" in those ecoregions considered to not have a demonstrated significant nexus to be designated as non-jurisdictional. We support the comment in the SAB's draft report in which they state that *"the Board notes, however, that the science does not support excluding groups of 'other waters' or subcategories thereof."* For the final rule to fulfill its objectives, and those of the Act, it must be science-based. In the case of the second portion of alternative 2, it must be understood that not finding a significant nexus is not scientifically the same as determining that these waters "lack a significant nexus to an (a)(1) through (a)(3) water," as stated in the proposed rule. While there may be a few instances in which such a statement of certainty and finality is justified by the circumstances and the science, most cases will be situations in which not finding a significant nexus simply means that the science currently available is insufficient to make such a designation. So, as science continues to emerge, areas in which a significant nexus could not currently be determined might indeed be later found to have a significant nexus based on new science. For the final rule to be truly science-based, it must allow for this distinct and likely possibility. Clearly, for regulatory purposes, those waters for which a significant nexus cannot be demonstrated at this time would need to be treated as non-jurisdictional unless and until shown otherwise.

The preamble requests comments "on how to best accommodate evolving science that could indicate a significant nexus for these 'other waters.'" This is a critically important consideration because, even as this rule is being reviewed and finalized, relevant new science continues to emerge, as it surely will long into the future. Science builds upon itself and is inherently cumulative. A science-based rule must recognize and incorporate that reality into the rule. We strongly recommend that the agencies incorporate into the final rule a process by which "other waters" within ecoregions, or single point of entry watersheds, can be subject to scientific assessment, and/or re-assessment as necessitated by emerging science, and the findings incorporated into the cumulative body of scientific "case law," so to speak. In that light, we again suggest that if the geographic database (with accompanying mapping features) discussed earlier were to be developed and maintained to facilitate the objectives of clarity, certainty, predictability, and administrative efficiency for the benefit of all stakeholders and affected publics, it could include data layers related to the findings of significant nexus analyses of "other waters" that would clearly depict:

- ecoregions and/or watersheds for which significant nexus analyses were conducted, and those for which an analysis has not yet been conducted;
- areas within which "other waters" in the aggregate were found to have a significant nexus and would therefore be jurisdictional;
- areas whose "other waters" in the aggregate could not at this time be demonstrated to have a significant nexus, and would therefore be non-jurisdictional; these areas could be subject to re-assessment as new science emerges;
- if applicable, areas in which it was determined that the "other waters" do not and could not possibly be shown to ever have a significant nexus, and therefore would be non-jurisdictional, or perhaps even excluded if the determination could be made with sufficient scientific finality; and,
- other relevant information.

We maintain that such a nationally standardized and consistently applied database would be a tremendously useful tool in many broad and significant ways that would ultimately benefit all aspects of the Act and its administration.

G. Waters that are not "Waters of the United States":

We agree with the inclusion of the expanded list of waters that would be explicitly excluded from jurisdiction. As the agencies well know, this proposed rule has been controversial, to a large extent because of confusion about which waters would be excluded and which could have jurisdiction restored (again, recognizing the overarching fact that the proposed rule will cover significantly fewer waters than are jurisdictional under the existing regulations). Much of the expressed concern and confusion has stemmed from within the agricultural community. Codification of the agricultural and other exclusions, direct and clear communications about them, and follow up administration of the rule that is fully consistent with those communications on a nationwide basis, will go a long way toward increasing certainty and predictability on the part of farmers, ranchers, and other landowners.

In addition, given the concerns that are often raised about small, inconsequential (from the perspective of affecting "waters of the U.S.") water bodies, we believe it is also important and useful for the agencies to have taken the step of explicitly listing a number of exclusions relevant to those concerns, e.g., gullies, rills, non-wetland swales, small ornamental waters, and water-filled depressions incidental to construction activity, among others. Expressly making all of these kinds of waters non-jurisdictional by rule will help convey clarity and address many of the concerns of important segments of the landowning public and, in particular, the farming and ranching communities.

Finally, with respect to the issue of groundwater, it is scientifically appropriate and necessary that groundwater be allowed to be used as an avenue of documenting significant nexus. It is among the most important of the types of connectivity that exists between adjacent, neighboring, and "other waters" and "waters of the U.S." However, given the abundant existing case law relative to governance of groundwater, it is appropriate that the final rule explicitly exclude groundwater from jurisdiction. Given the magnitude and importance of that issue to the states and landowners in many parts of the country, any change to existing practices with respect to state-based regulation of groundwater should come only as a result of Congressional action. Similarly, it is also desirable to be very clear that the proposed rule has no impact on states' authorities to regulate water from the standpoint of addressing quantity and allocation issues. We believe the new rule could and should actually benefit those efforts by helping to maintain water flows in "waters of the U.S.," particularly if findings of significant nexus are scientifically justified and jurisdiction by rule is extended to the "other waters" in ecoregions in which wetlands and other waters contribute to base flows and are important components of the ecosystem.

III. Science-based Comments Regarding Connectivity and Significant Nexus Considerations for Specific Regions

A. Introduction

In this section of our comments we will attempt to highlight and augment some of the existing science that supports a finding that the "other waters," in the aggregate and across broad ecoregions, or significant portions thereof, possess a significant nexus with downstream jurisdictional waters. The draft Connectivity Report contains a tremendous amount of information that bears upon this key issue, and we recognize we will repeat some of that as we attempt to add to and synthesize the science for a few regions. We are also aware that the final set of recommendations from the SAB's special panel on connectivity will contain additional references to relevant literature, and that many of those citations will likely be incorporated into the final Connectivity Report.

That being the case, we will focus on conveying the primary points relevant to the existence of a significant nexus, as supported by key citations, in order to frame the case in support of these wetlands being designated as jurisdictional by rule. We understand that agency scientists with access to the referenced reports and all the science contributed through the public comment period will ultimately be responsible for synthesizing the wealth of information from these diverse sources as the rule is finalized.

The area on which we will focus much of our attention is the Prairie Pothole Region. This landscape is the United States' most important waterfowl breeding and production area, and it contains more wetlands, at a higher density, than any other comparable area in the U.S. Thus, prairie pothole wetlands provide one of the best opportunities to show that a large subcategory of wetlands falling primarily within the "other waters" category do indeed have a demonstrable significant nexus with downstream navigable waters. While we put special focus on the Prairie Pothole Region, we have also compiled some similar information for Texas Gulf coastal prairie wetlands and Nebraska's sandhill wetlands, in particular, and included scientific citations from other key wetlands such as playas and rainwater basins. The wetland types and regions we have focused on were selected for special emphasis for several reasons: (1) they are all key wetlands and landscapes for waterfowl conservation; (2) wetland loss has been significant in each region and the remaining wetlands are highly threatened in the absence of CWA protections; (3) there is literature that clearly demonstrates the abundance and strength of the significant nexuses that exist among these waters and with downstream navigable waters; (4) these wetland types largely fall into the "other waters" category; and, (5) despite individual wetlands often not being situated in proximity to (a)(1) through (a)(3) waters, there is a compelling scientific basis for the vast majority of these waters to be considered jurisdictional on the basis of a comprehensive, science-based significant nexus evaluation.

In our synthesis of much of the related science for the Prairie Pothole Region and other areas, we will also offer citations referencing science that, while it may not have been conducted within the region, nevertheless informs the fundamental question of significant nexus in a geographically broad way such that the findings of the research are to at least some degree applicable to the Prairie Pothole Region.

As the agencies conduct these evaluations, they should keep in mind the overall context within which important decisions about significant nexus and jurisdiction will be made. The CWA has been an important component of the national framework of wetland conservation for more than 30 years. It has been the basis of one of the most successful environmental efforts in the

Nation's history, and has helped measurably improve the chemical, physical, and biological aspects of the Nation's waters since its enactment. However, approximately 53% of the estimated 221 million acres of wetlands originally present in the United States have been lost (Dahl 2000). The CWA undoubtedly contributed to the decrease in the rate of wetland loss since 1972, when the Act was passed, through 2004 (Dahl 2006). However, not counting the increases of ponds that often have little wildlife value (e.g., golf course ponds, storm water retention lagoons, farm ponds, etc.), the Nation has nevertheless experienced a net loss of over 16 million acres of wetlands since the mid-1950s. Since 1986, the Nation has lost over 2 million acres of vegetated wetlands and 1.4 million acres of freshwater marshes that are among the most important wetlands for waterfowl and other wildlife (data from Dahl 2000; Dahl 2006; Dahl 2011). These kinds and magnitudes of losses have had a cumulative negative impact not only on critical waterfowl habitats, but also on the Nation's water quality and other federal interests.

Unfortunately, the most recent national wetlands status and trends report (Dahl 2011) reported that between 2004 and 2009 the rate of wetland loss had increased by 140% over the previous report period. This is the first acceleration of wetland loss over a 50-year period, and given that this is the first survey period occurring entirely post-*SWANCC*, the acceleration of wetland loss is likely at least partially attributable to the jurisdictional confusion and withdrawal of CWA protections by the agencies in the wake of the *SWANCC* and *Rapanos* cases.

Therefore, it is reasonable to anticipate that the trajectory of the future status and trends of the Nation's wetlands will be significantly influenced by the content of the final rule on the "definition of the 'waters of the U.S.'" We believe that the science, viewed comprehensively, clearly supports the contention that the loss of over 50% of the Nation's wetlands has had a lasting, negative effect on the physical, chemical and biological integrity of navigable waters partly as a direct result of the lack of recognition and appropriately science-based regulatory framework to protect those waters that have a significant nexus with downstream navigable waters. Thus, the level of protection afforded wetlands by the final rule will be a significant determinant of the future trajectory of the status of wetlands in this country, and therefore of the future direction of the condition of the Nation's waters.

B. Prairie Potholes

<u>Prairie Potholes: General Information and Status</u>

The Prairie Pothole Region (PPR; Fig. 1) of the northern Great Plains encompasses over 300,000 square miles, and is situated within four Level III ecoregions (#42, 46, 47, and 48). This is the most important breeding area for ducks (e.g., mallards, blue-winged teal, northern pintails, canvasbacks) in North America (Ducks Unlimited 2001). An estimated 50% of the total average annual production of continental duck populations originate from this region (Dahl 1990), including up to 70% in wet years (Ducks Unlimited 2001). One analysis (U.S. Fish and Wildlife Service 2001) suggested that duck production in the PPR of the U.S. northern prairies would decline by over 70% if all wetlands less than one acre were lost, and another analysis (Johnson 2010) estimated that pre-CWA wetland loss in a five-county portion of the PPR in west-central Minnesota resulted in a reduction in waterfowl productivity in excess of 80%. Because of the PPR's importance to continental waterfowl populations, and as a response to the challenges of wetland loss in the region, Ducks Unlimited and its partners have expended billions of dollars to protect and conserve the wetlands and other habitats that remain in the region.

However, despite those investments, which include significant federal resources, there continues to be a net loss of wetlands in this region (Dahl 2006; Dahl 2014). Oslund et al. (2010) documented that the Prairie Coteau portion of Minnesota's PPR lost 15% of its wetlands between 1980 and 2007, and the Minnesota River Prairie ecological region lost 7.9%. The most recent evaluation of wetland status and trends in the PPR (Dahl 2014) documented a net loss of over 74,000 acres of wetlands, and a loss of over 95,000 acres of emergent wetlands. Interestingly, some of the greatest rates of loss were noted in the places (e.g., Minnesota) that had already experienced some of the greatest overall wetland loss (quantity) over time. Historic drainage has been most intense in Iowa, where about 95-99% of the original wetlands (Dahl 1990; Miller et al. 2009) have been lost. Miller et al. (2009) indicated that about 30,500 ac remain out of what was originally about 3.5 million ac, or almost 50% of that region in Iowa.

Prairie pothole wetlands are stereotypical examples of wetlands that would generally be characterized as being "geographically isolated" and classed as "other waters" in the proposed rule. The region is characterized by high wetland densities, and typically contains between 15 and up to 150 wetlands per square mile (National Wetlands Working Group 1988; Baldasarre and Bolen 2006; Fig. 2 - 6). With typically high wetland densities over such a large area, it is estimated there were originally approximately 20 million acres of prairie pothole wetlands, largely in the Dakotas, Minnesota and Iowa, and one study estimated wetlands covered approximately 25,000 square miles of the region (van der Valk and Pederson 2003). As of 2009, Dahl (2014) estimated 6.4 million acres of wetlands remained in the U.S. PPR, involving 2.6 million wetland/water basins.

In general, the PPR possesses a limited internal drainage system so inflow and outflow to prairie potholes via streams is uncommon (Winter and Woo 1990; Carroll et al. 2005; Fang et al. 2014). One analysis (Petrie et al. 2001) documented that most (>95%) prairie potholes would likely not be considered adjacent to, or even located within 0.6 mi (~50%) of navigable or jurisdictional waters. However, as is readily apparent from Figures 2 – 6 or a casual look at satellite imagery throughout the region, and as documented most recently by Dahl (2014), wetlands in the PPR tend to be remarkably similar in general size and structure, and consequently function. Of the total 6.4 million acres of wetlands in the U.S. PPR, 88% are emergent wetlands (i.e., marshes), making up 93% of all wetland basins in the region (Dahl 2014). Open water ponds made up only 4% of the remaining acreage, while 8% had woody vegetation (forested and scrub-shrub wetland; Dahl 2014). Most of the latter are located along stream and river courses, and near large lakes. Because they are so similar in structure and function, the emergent marsh habitat that comprise the potholes are sometimes further classified by the amount of time that they typically contain water, although that classification is subject to change to some extent depending upon the dynamics of short and long-term precipitation and climatic regimes (Stewart and Kantrud 1971). Dahl (2014) documented that in 2009 almost 50% of the emergent wetland basins were temporarily flooded (temporary ponds, low prairie wetland), about 42% were seasonally flooded (seasonal ponds, shallow marsh), 6% were semi-permanently flooded (semi-permanent ponds, dugouts, deep marsh), and about 2% were farmed wetlands. The agencies are encouraged to consult Dahl (2014) and others for more detailed information about prairie pothole wetland status and ecology.

In large part, the marked similarity among prairie potholes is due to the fact that they were all formed when large chunks of ice were dropped by the receding glaciers along with other materials that had been carried southward by the glaciers. The pothole basins are the depressions that remained after the chunks of ice melted amongst the other material left behind, thereby creating the knob and kettle and moraine landforms that dominate there.

We will provide a sense of the documentation and scientific literature that supports the determination that wetlands in the PPR, in the aggregate, generally possess a significant nexus with navigable waters as outlined by Justice Kennedy. The case is most convincingly, and efficiently, made at the ecoregional scale. There are several compilations of peer-reviewed literature and related information (e.g., Tiner et al. 2002; several papers in the September 2003 special issue of the journal *Wetlands*) that provide an abundance of detail regarding the points we reference in these comments.

<u>Prairie Potholes: Surface Water Storage and Flood Attenuation</u>

Prairie pothole wetlands and their function of water retention might very well have been what Justice Kennedy had in mind when he wrote that, *"given the role wetlands play in pollutant filtering, flood control, and runoff storage, it may well be the absence of hydrologic connection (in the sense of interchange of waters) that shows the wetlands' significance for the aquatic system,"* and that *"wetlands possess the requisite nexus, and thus come within the statutory phrase "navigable waters," if the wetlands, either alone <u>or in combination with similarly situated lands in the region,</u>* [emphasis ours] *significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'"* The abundance and density of potholes on the PPR landscape in conjunction with their general lack of direct surface water connection to streams and rivers is most important in creating the basis for an especially significant nexus between these wetlands and large navigable waters like the Red, Missouri, and Mississippi rivers.

The proposed rule states: *"Tributaries serve to store water, thereby reducing flooding, provide biogeochemical functions that help maintain water quality, trap and transport sediments,* *transport, store and modify pollutants, provide habitat for plants and animals, and sustain the biological productivity of downstream rivers, lakes and estuaries."* We submit that, based on the body of the available science, the same can be said for prairie pothole wetlands and some other wetland subcategories. Just as water during storm events moves through the multitude of small tributaries and eventually affects the integrity of downstream "waters of the U.S.," the same thing occurs with prairie potholes although in the case of the potholes, it is more common for them to serve the function of storing water that would otherwise flow to downstream waters and thereby affect the downstream navigable waters by decreasing flood flow. However, in many cases, a "fill and spill" type of connectivity is exhibited when the wetland fills to capacity and then spills over into other wetlands and/or to downstream waters (Kahara et al. 2009; Shaw et al. 2012; Shaw et al. 2013; Winter and LaBaugh 2003). During wet periods, there might actually be a smaller number of wetlands on the landscape as a result of nearby wetlands becoming "aggregated" (Kahara et al. 2009) as a result of the magnitude of stored water in areas of high pothole density.

Their nature and position on the landscape is the primary reason that potholes serve so well the function of capturing runoff and storing it in intact "non-contributing" basins, i.e., wetlands and lakes (Winter et al. 1984). In general, the presence of many isolated wetlands decreases runoff velocity and volume by capturing high magnitude short duration flows, e.g., runoff of spring thaws, and releasing water (such as through groundwater and evaporation) over an extended period (Carter 1996; Carroll et al. 2005). The net effect of this important wetland function is to abate flooding by lowering and moderating the peaks of flood stages, thereby reducing flood damages (Mitsch and Gosselink 1986). Prairie potholes store surface water and attenuate flood flows (Hubbard and Linder 1986; Gleason and Tangen 2008; Minke et al. 2009), and potholes in North Dakota have been estimated to hold roughly half the surface water within the state (Ripley 1990). Winter (1989) stated that for selected watersheds in Minnesota, mean annual flood increases were inversely related to the percentage of lakes and wetlands within the watersheds. Stated another way, the flood increases in the watersheds Winter (1989) studied are directly proportional to the amount of drainage of lakes and wetlands within the watersheds. Other work (Kantrud et al. 1989; Hayashi et al. 2003; Huang et al. 2011) concluded that small pothole wetlands retained most of the runoff from spring snow melt within their respective watersheds, thereby moderating snow melt input to regional drainage systems. Miller and Nudds (1996) compared U.S. and Canadian rivers and landscape changes on each side of the international border to provide further evidence that wetland drainage in the upper reaches of the Mississippi River watershed has increased flooding in the Cannonball and Sheyenne rivers in North Dakota, and the Moreau and Big Sioux rivers in South Dakota.

Vining (2002) demonstrated the importance of storage by wetlands and impacts on stream flow of Starkweather Coulee in North Dakota, stating that his findings were likely similar to the situation found in other drainage basins. Vining (2004) also studied two watersheds in the Red River Basin of North Dakota and Minnesota with results indicating that total stream flow from a flood event was reduced due to storage in wetlands. And although the Red River basin of northwest Minnesota has only 25% of its wetlands remaining, Pomeroy et al. (2014) demonstrated that even in PPR watersheds that have been subjected to extensive drainage, downstream flows can nevertheless be “strongly impacted by further drainage.” For a Minnesota watershed, Wang et al. (2010) estimated that the loss of the first 10-20% of its wetlands resulted in up to a 40% increase in the peak discharge to downstream waters.

Much recent research on potholes and water storage has been conducted just across the border in Canada. Ecologically, the PPR of southern Canada is simply an extension of and similar to the ecoregions in the U.S., with only the political border of the two countries separating the two areas. Thus, these Canadian studies are directly relevant to significant nexus evaluation on the U.S. side of the border. In the absence of federal wetland legislation and weakly enforced provincial regulation, prairie potholes in Canada are being drained at an even faster rate than those in the U.S. For example, it was recently estimated (Ducks Unlimited Canada, unpubl. data) that Saskatchewan alone had lost about 617,750 ac of pothole wetlands over the last 60 years, and was losing about 15,000 ac of wetlands annually. The volume of water estimated to have been contained within those basins was approximately 400,000 ac ft. The extent of the cumulative changes to the regional hydrology stemming from the cumulative loss of “other waters” is evident at even a cursory look at satellite images of the region (Fig. 7) when coupled with an understanding that all the water once contained within those potholes now drains quickly to streams and rivers via the artificial connections created by the drainage activities.

Hayashi et al. (1998) found that approximately 30-60% of the water in the potholes entered as runoff from spring snowmelt. Thus, when considered in the context of wetland densities and the total storage capacity of the wetlands in the region, this represents a huge volume of water that would otherwise move through artificial ditches until ultimately reaching a navigable waterway and increasing flood flows in the river. Fang et al. (2014) and Pomeroy et al. (2014) studied water storage in wetlands and the relationship to downstream flood flows in the 150 mi^2 Smith Creek watershed in Saskatchewan. Pomeroy et al. (2014) demonstrated that the annual volume of streamflow, as well as peak daily discharge, had a “remarkably strong sensitivity” to historic wetland drainage over the 1958 to 2008 period. They demonstrated that wetland drainage had a strong impact on stream flood flows associated with both snow melt and rainfall. They also estimated that continued drainage of the remaining geographically isolated pothole wetlands would increase annual flow by up to 32%. The extent of the artificial connectivity created, and related impacts to the hydrology of the region, is evident in examining a representative portion of that particular landscape (Fig. 8). Other analyses they conducted resulted in similar findings, and were ultimately demonstrably important to the quality of water in downstream Lake Winnipeg (Pomeroy et al. 2014), the third largest lake contained within the borders of Canada.

Specifically, in the Red River basin which delivers the majority of the nutrients to Lake Winnipeg, over 50% of the wetlands have been eliminated in the U.S. portion of the watershed

(Schindler et al. 2012), with as much as 90% or more loss in the portion of the Red River watershed in Canada (Hanuta 2001). Over this same time frame and looking at a number of watersheds in the PPR of central Saskatchewan and in the Lake Winnipeg watershed, the runoff:precipitation ratio has increased dramatically (Ehsanzadeh et al. 2011), likely due to the synergistic interaction of increased drainage (i.e., increased hydrologic connectivity) and precipitation. Increases in flooding and water yield have been directly linked to increased phosphorus export in the Lake Winnipeg watershed (Environment Canada and Manitoba Water Stewardship, State of the Lake Report 2011) and demonstrate the ability for isolated wetlands, in the aggregate and at the level of the watershed, to affect the integrity of one of the world's largest lakes.

Wetland drainage has significantly decreased the cumulative storage capacity of wetlands (Dahl 1990; Dahl and Johnson 1991; see Fig. 9 for example), and this decrease has been linked to increases in the frequency of flooding in and around the PPR (Miller and Frink 1984; Miller and Nudds 1996; Manale 2000). In most cases, as previously stated, when a pothole is drained or filled, the water that would have otherwise been retained in the basin is diverted to a ditch or other conveyance and makes its way to a navigable waterway much more rapidly than when the wetland was intact. The significant nexus between the intact pothole and the nearest navigable water, described by Justice Kennedy as the "absence of [direct] hydrologic connection," then becomes apparent as the altered flow pattern (see Fig. 10 for example) brings more water, carrying more sediment, nutrients and other pollutants, much more rapidly, to the navigable water and downstream communities, farms, and other landowners.

For example, a recent study of the Broughton Creek watershed in the Red River Valley in the northeastern PPR (Yang et al. 2008), which also provides water to Lake Winnipeg, documented that 70% of the wetlands had been lost or degraded due to drainage between 1968 and 2005. These wetland losses were associated with a 31% increase in the contributing area draining downstream, which was associated with a 30% increase in stream flow and an 18% increase in peak flow. Further work on Broughton's Creek (Yang et al. 2010) showed that if the wetlands in the watershed could be restored to 1968 levels, peak creek discharge could be reduced by 23.4%, similarly demonstrating the significant impact of these wetlands on flowing waters. If protected and left intact, they store water, but when unprotected and drained, the potholes contribute significantly increased flood flows to the downstream receiving waters, thereby affecting their integrity (see Fig. 11 for example). This impact is even more significant when the sediment and chemicals carried in this additional discharge are also considered (as discussed in a later section). Similarly, Johnson et al. (1997) reported that about 33% of the drained wetlands in the flood-prone Vermillion River watershed (southeast South Dakota) flowed into artificial drainage ditches, and that a quantity of water equivalent to about half of the river's annual flow could be stored by restoring those wetlands. Pomeroy et al. (2014) pointed out that artificial drainage of prairie potholes has the effect of adding permanent surface connections, thereby reducing the ability of the watershed to store water, even under wet conditions, with the consequences being increased stream flood frequencies and magnitudes (Gleason et al. 2007; Yang et al. 2010). Brun et al. (1981) also found that increased stream flows in the Red River Valley were strongly correlated with the extent to which a watershed's wetlands had been drained. Jahn (1981), also in the context of the Red River system, stated that wetlands there significantly reduced flood levels in major metropolitan areas downstream.

Hey (1992) estimated that as a result of approximately two-thirds of the original potholes having been lost to drainage, the region has lost 20-30 million acre-feet (0.87-2.2 trillion cubic feet) of water storage capacity. A number of studies have concluded that loss of pothole wetlands has contributed significantly to flooding and increases in associated damages along the Red River of North Dakota and in portions of Minnesota and Iowa (e.g., Campbell and Johnson 1975; Moore and Larson 1979; Brun et al. 1981). Ludden et al. (1983) found that small basins in the Devil's Lake watershed in North Dakota could store 72% of the total runoff from a two-year frequency flood and approximately 41% of the total runoff from a 100-year frequency flood, with Malcolm (1979) and Gleason et al. (2007) and others reporting impacts of similar magnitude for north central North Dakota and western Minnesota, respectively. Hann and Johnson (1968) found that depressional areas in north central Iowa had the ability to store more than one-half inch of precipitation runoff within their individual watersheds.

The results of several studies shed light on the issue from the converse perspective of evaluating the water retention benefits to downstream waters of restored wetlands, and strongly support the same general finding that a significant nexus exists between prairie potholes, in the aggregate, and nearby (viewed from a regional, ecologically valid scale) navigable waterways. Gleason et al. (2008), based on a study covering almost 500 wetlands across Iowa, North Dakota, South Dakota, Minnesota, and Montana, conservatively estimated wetland catchments covering ~1.1 million acres on USDA Conservation Reserve Program and Wetland Reserve Program lands can capture and store an average of 1.1 acre-feet of water per acre of wetland (a total of more than 1.2 million acre-feet [52.2 billion cubic feet] of water). This estimate did not account for the additional water that would further reduce water flowing to the navigable waters as a result of infiltration to groundwater and evapotranspiration. Although these particular areas represented pothole wetlands that were restored to the landscape as a result of a voluntary government incentive program, the clear inference that can be drawn is that if this quantity of natural wetlands were lost because of a lack of CWA protection, there would be significant impacts from the more than 1.2 million acre-feet of water that would otherwise flow more directly and rapidly to the downslope navigable waters.

Gleason et al. (2007) simulated the effects of wetland restoration in the upper Mustinka sub-basin (Red River valley of west central Minnesota) and found that restoring 25% of the restorable wetlands there would increase flood storage by 27-32%, and a 50% restoration would increase storage by 53-63%. Similarly, if viewed as if those wetlands were natural wetlands remaining on the landscape and the impacts of their removal were under consideration, these results provide a sense of the magnitude of the impacts on downstream waters, i.e., the significance of the nexus, as a result of that lost flood storage capacity.

Kurz et al. (2007) modeled peak flow reductions associated with artificial storage of precipitation on flooded agricultural lands in the Red River valley of the north central PPR, and estimated that with both conservative (259,000 acre-feet) and moderate (2,188,400 acre-feet) storage volumes placed on the landscape, flood stages like those of the flood of 1997 on the Red River could have been reduced by 2-5 feet at Grand Forks. Thus, it is reasonable to predict that similar impacts of flood attenuation would be associated with similar storage volumes in natural wetlands, again demonstrating the significant nexus that exists between the aggregate of the pothole wetlands with navigable waters.

Although potholes typically are not directly hydrologically connected to other waters via surface connections, during wet periods water tables rise and surface water levels reach outlet elevations of most potholes (Sloan 1972; LaBaugh et al. 1998; Winter et al. 1998; USGS 1999). This "fill and spill" phenomenon results in temporary but direct hydrologic connections among and between potholes, and between complexes of potholes and the streams and rivers in the region, with associated impacts on regional water regimes in navigable waters and their tributaries (Stichling and Blackwell 1957; Sloan 1972; Leitch 1981; Winter 1989; USGS 1999; Leibowitz and Vining 2003).

Lenhart et al. (2011) studied the wetlands in the Minnesota River Basin, which covers much of central and western Minnesota and some of Wisconsin. Their significant findings are most applicable to the eastern portion of the PPR, where the topographic relief is generally lower and there is a more integrated drainage system. They noted that over the last 30 years stream flows at less than bank full elevation had increased, and that while large floods had not significantly increased, the larger, longer duration flow volumes had a significant impact on the movement of sediment and nutrients, with clear implications for total daily maximum loads and nutrient management issues. Odgaard (1987) found average daily flows only one-third bank full were associated with increased bank erosion, streambank collapse and downstream sedimentation. Looking broadly at agricultural watersheds in two time periods (1940-70 versus 1980-2009), Lenhart et al. (2011) found streamflow had increased in the agricultural landscapes due to increased stormwater runoff and base flows, both of which are associated with wetland drainage. They stated mean annual flows had increased in most of the Minnesota River basin and Red River basin, as well as in the Des Moines, Sugar and Root rivers.

In an important recent study of 21 southern Minnesota watersheds, all contributing flow via tributaries to the Mississippi River, Schottler et al. (2013) showed surface drainage of wetlands was a significantly greater driver of increased downstream river flow than was land conversion to crops, precipitation, or subsurface tile drainage. They demonstrated drainage (depressions lost as a percentage of watershed area over a range of about 3% to 19%) was highly correlated with increases in water yield across the 21 watersheds. Importantly, the consequences of the increased flows extended to increased erosion and widening of stream channels which in turn causes increased turbidity and sediment loading and transport (Wolman and Miller 1960; Doyle et al. 2005; Simon and Rinaldi 2006). Schottler et al. (2013) quantified six watersheds and also found a direct relationship with channel widening (up to 10-40%) with drainage of wetland basins, stating that that their findings were broadly applicable to the region.

Prairie Potholes: Surface-Groundwater Interrelationships

Prairie potholes, as well as other types of "other waters," can, and very often do, contribute to groundwater recharge, and this groundwater often continues to move downslope toward intermittent or flowing streams ultimately discharging into navigable waters or their tributaries (Winter et al. 1998). For prairie potholes, where the water table tends to be a subdued image of the topography and is generally very near the land surface (Sloan 1972), pothole wetlands can serve as groundwater recharge sites (Euliss et al. 1999). Winter and LaBaugh (2003) stated that prairie potholes are commonly connected via groundwater flow systems, and water that seeps from the wetland into shallow gravel aquifers can annually travel many kilometers, while movement through clay or silt layers can be much slower. A study of the water balance of potholes in southern Saskatchewan found that subsurface flow out of study wetlands was relatively minor in a clay-rich deposit (Conly and van der Kamp 2001), but given the extremely large number and high density of potholes in the region even minor contributions from each one (Hayashi et al. [1998] estimated 1%) represents a significant contribution to groundwater resources in the aggregate. In some areas, such as Cottonwood Lake, North Dakota on the edge of the Missouri Coteau, 16% of the outflow from potholes in the study area was discharge to the underlying aquifer (Carroll et al. 2005). Van der Kamp and Hayashi (1998) stated that there is little groundwater recharge from dry uplands outside depressions, and that groundwater recharge from small depressions constitutes a large proportion of the total recharge in many areas.

Winter and Rosenberry (1998) stated that some water seeping from potholes into groundwater passes beneath local flow systems and discharges to wetlands at lower elevations, commenting on the complexity of the connections between potholes and groundwater while recognizing that the fundamental connections are nevertheless common. Some of the complexity results from the dynamic climatic and related water conditions on the prairies (LaBaugh et al. 1996; Rosenberry and Winter 1997; Winter and Rosenberry 1998), underscoring the importance of using a weight of the evidence approach to determining significant nexus in such systems. Short-term, scientifically verified determinations are not only costly and largely impractical to apply, they can also lead to conclusions that are incorrect in the long-term due to their short-term nature and inability to account for variation over time.

A number of studies have shown that connections between the groundwater and the water contained within potholes occur mainly at the shoreline zones where more impermeable soils of the basin grade into more permeable soils in transition zones, or through fractures in the basins' substrate (Williams and Farvolden 1967; Millar 1971; Eisenlohr and Sloan 1972; Sloan 1972;

Weller 1981). Furthermore, because seepage contributions to groundwater are greatest where wetland shoreline is largest relative to the water volume (Millar 1971), the smallest pothole wetlands are proportionately more important to groundwater connectivity. Sloan (1972) stated that surface water seepage to groundwater was greater for ephemeral and temporary wetlands than for other wetland types. These are the very types of wetlands that are currently being drained at the greatest rates (Dahl 2014), and are most at risk of degradation or loss absent CWA jurisdiction. Woo and Rowsell (1993) examined recharge from potholes and adjacent land in southern Saskatchewan and found that the inundated zone of the pothole itself contributed much more to recharge of the shallow subsurface aquifer (three orders of magnitude) than the adjacent non-inundated zone.

Some potholes have a net seepage outflow (groundwater recharge basins), others have a net seepage inflow (groundwater discharge basins), and many basins function alternately - at times having a net outflow into the groundwater and at other times having a net inflow (Sloan 1972; Swanson et al. 1988; LaBaugh et al. 1998; Johnson et al. 2004). Hubbard and Linder (1986) concluded that approximately 12% of the total storage capacity of wetlands in an area in northeast South Dakota infiltrated to groundwater as recharge, and that drainage of potholes therefore significantly reduces ground water recharge rates. Net seepage outflow into the groundwater can more typically amount to 20-30 percent of the total water loss for prairie wetlands (Eisenlohr and Sloan 1968; Shjeflo 1968; Eisenlohr and Sloan 1972; Winter and Rosenberry 1995).

Pothole wetlands are generally connected to and continuous with the groundwater in the surrounding area in relatively local groundwater flows (van der Kamp and Hayashi 2008), but these surficial aquifers can extend up to several miles. Regional aquifers are located deeper than the surface aquifers, and water flow into and through these deeper aquifers can be significant in locations in which they underlay an extensive area, and often flow to distant discharge areas (van der Kamp and Hayashi 2008). While a relatively small portion of recharge water flows to these deeper, geographically more expansive regional aquifers, this portion of the groundwater recharge from wetlands is important for sustaining groundwater resources (van der Kamp and Hayashi 2008). Input from wetlands on the topographically higher parts of the landscape (such as the Missouri Coteau and Prairie Coteau in North and South Dakota and Minnesota, where wetland densities are often highest) most commonly recharge regional aquifers. Hayashi et al. (1998) documented for one wetland that approximately 4% of infiltration reached a regional aquifer, so this clearly can be a significant volume of recharge water to aquifers when multiplied by tens or hundreds of thousands of similarly situated wetlands within a region.

To support CWA jurisdiction, it is important to note that the groundwater to which the pothole wetlands are linked subsequently provides input to lower-lying wetlands and stream valleys (van der Kamp and Hayashi 1998). Numerical simulation of regional groundwater flow systems in Stutsman and Kidder counties, North Dakota, portrayed lateral movement of groundwater flow over 16 miles to discharge into Pipestem Creek, a prominent stream in the region (Winter and Carr 1980). In another area of the PPR in northwest Minnesota, Cowdery et al. (2008) demonstrated that horizontal hydraulic conductivity in shallow aquifers was high and that these aquifers can extend tens of miles in the region and interact with deep aquifers in some areas. Surface aquifers were recharged in significant part from surface waters, particularly from at-risk seasonal and ephemeral wetlands. Notably, discharge areas for the water from these shallow aquifers included surface waters, as well as withdrawal from wells. In fact, 17-41% of the water from the surface aquifers was discharged to surface waters that left the study area, and groundwater discharge comprised 30-71% of all surface drainage flow, helping to maintain base flow. van Voast and Novitzki (1968) concluded that groundwater and surface water interconnections (including flowing waters) were typical in the Yellow Medicine River watershed in the PPR region of southwest Minnesota.

Prairie Potholes: Water Quality Relationships

Potholes act as sinks for nutrients and other chemicals, including those widely used for agricultural purposes, and thereby affect and improve the quality of runoff water (van der Valk 1989; Davis et al. 1981; Crumpton and Goldsborough 1998; Whigham and Jordan 2003). Ditches draining potholes create new surface connections between previously geographically isolated wetlands and tributaries and rivers (Brunet and Westbrook 2011). With pothole wetlands being the landscape's primary storage area for nutrients and salts, these solutes (along with increased sediment loads) are transported via these new surface connections downstream when the potholes are drained (Brunet and Westbrook 2011; Lenhart et al. 2011). Yang et al.'s (2008) study of the Broughton Creek watershed estimated that a 31% increase in nitrogen and phosphorus load from the watershed and a 41% increase in sediment loading were associated with wetland loss in the watershed. Yang et al. (2010) looked at this issue using an alternate approach, providing additional support to their earlier conclusions regarding both nutrients and sediment. Thus, when as a result of the ditching or filling of wetlands the retention time is shortened or eliminated and the associated biochemical processes are thereby altered, the cleansing or filtration function of the former wetland is lost or degraded, with direct negative impacts on the quality of the downstream navigable waters. Similarly, water retained in a pothole is cleansed of much of its load of pollutants via biochemical processes before it enters groundwater and flows laterally to other areas and other waters, or downward into deeper aquifers, as described earlier.

Goldhaber et al. (2011) indicated that oxygenated groundwater in the region interacts with soil constituents and focuses sulfate-bearing water from topographically higher to lower areas. Of course, drainage courses that ultimately flow to navigable waters are the topographically lowest areas in the landscape, and would therefore be chemically altered as a consequence of changes to the connections between wetlands, groundwater, and the flowing waters. In addition, Cowdery et al. (2008) pointed out that one of the discharges of aquifers was withdrawal from wells for domestic and farm/ranch use. Therefore, filling or draining of pothole wetlands so that infiltration is reduced or water quality affected, or the addition of pollutants to the wetland from any source, would likely ultimately affect the well water quality (as well as the quality of navigable waters receiving discharges from the affected aquifer from either surface or subsurface flows).

Ginting et al. (2000), working in the Minnesota River watershed, also showed that draining wetlands there led to increased runoff, thereby carrying elevated levels of solids and nutrients into downstream waterways. The findings of Lenhart et al. (2011) and Odgaard (1987) described earlier clearly demonstrated that the physical impacts of increased downstream flows resulting from drainage of potholes were also accompanied by degradation of the physical and chemical integrity (increased sediment movement and nutrient transport and concentration) of downstream waters in the PPR. The increased stream flows that result from draining potholes and reducing the retention time of water on the landscape causes increased stream flow, which in turn increases river erosion, bank sloughing and widening, and reduces water quality by increasing turbidity and sediment loads (Schottler et al. 2013). All of these significant impacts to the integrity of downstream waters are the direct consequence of the drainage or filling of pothole wetlands across the landscape.

Water captured and retained within pothole wetlands has been shown to have elevated levels of pesticides. In a portion of the Canadian PPR containing almost 1.8 million potholes, up to 60% of the wetlands examined exceeded Canadian guidelines for the protection of aquatic life for at least one pesticide (Donald et al. 1999). Squillace et al. (1996) found that in the Cedar River basin of Iowa a number of agricultural chemicals moved from surface water bodies into the groundwater, and subsequent movement and discharge of that groundwater served as the primary source of these chemicals entering the Cedar River and thereby impacting its chemical integrity. Concentration of pesticides in wetlands across broad areas in other landscapes with an important wetland component, e.g., the High Plains with its playas, has also been demonstrated (Belden et al. 2012), thus drainage would mean these waters with elevated pesticide levels would flow to and impact the chemical integrity of downstream waters if drained.

Blann et al. (2009) provided an important and comprehensive review of the effects of agricultural drainage in the southern PPR on the aquatic ecosystems of the region. Their work provides an excellent overview of the inter-relationships between predominately geographically isolated wetlands, groundwater, and flowing waters that would be jurisdictional under the proposed rule.

Prairie Potholes: Biological Nexus

Although prairie potholes are biologically significant on a continental scale due to their continental importance as a breeding landscape for waterfowl and other migratory birds, because of the relative paucity of internal drainage networks there has to date been little research on the biological connections between this category of "other waters" and navigable waters in the context most useful to the proposed rule. In one important study, however, Lannoo (1996) demonstrated that where PPR wetlands have been connected to navigable waters (e.g., in the Iowa Great Plains region), amphibian populations in the formerly isolated wetlands have decreased significantly. Thus, in an instance such as this, the creation (by draining and ditching) of a surface hydrological nexus where none previously existed between the wetland and navigable water had a significant negative effect on the biological integrity of the waters involved. In addition, several waterfowl species require or use both saline lakes and freshwater wetlands and rivers in North Dakota (Windingstad et al. 1987; Swanson et al. 1984), with the freshwater wetlands being necessary for purposes of osmoregulation.

In addition, the cumulative impacts of pothole drainage to downstream waters, including increased pesticide levels (Donald et al. 1999) and increased turbidity and sedimentation (Gleason et al. 2003; Schottler et al. 2013), would clearly impact the biological integrity of downstream waters. Gleason et al. (2003) found that sediment deposition of only 0.5 cm resulted in a 99.7% reduction in total invertebrate emergence and 91.7% reduction in seedling emergence in an experiment conducted in the context of the PPR. The increased flows in downstream waters resulting from drainage or filling of potholes (see previous section and citations) would also affect the capability of those waters to sustain populations of organisms more suited to the lower flows, decreased concentrations of nutrients and other solutes, and lower sedimentation rates of waters not impacted by drainage. Thus, the biological impacts to aquatic life in navigable waters that result from the increased hydrological connectivity and corresponding increases in stream flow and erosiveness, sediment loads, and nutrient and pesticide concentrations, cannot be ignored as an important component of the significant nexus evaluation for the ecoregion.

Prairie Potholes: Economics

Some of the greatest economic impacts associated with the alteration of the significant nexus between pothole wetlands and navigable waters in the PPR are those associated with increased flood damages resulting from lost flood attenuation functions. For example, the estimated net benefit of artificially storing water in the Red River valley as described by Kurz et al. (2007) exceeded $800 million over 50 years in some scenarios as a result of reduced flood stages in the Red River and avoided damages and other benefits. Hey and Phillipi (1995) documented that mean annual flood damage in the Upper Mississippi River basin had increased 140% over the previous 90 years (in adjusted dollars). Given the extent of increasingly frequent damaging floods along rivers in and flowing out of the PPR (as well as in other areas around the country), the economics associated with avoided damages through wetland protection and maintenance of flood water storage functions should also be an important component of significant nexus analyses.

One recent study (Yang et al. 2008) also estimated the value of the nutrient removal and carbon sequestration services lost due to draining or altering potholes in the Broughton's Creek watershed since 1968 to be $430 million.

In summary, we believe that the weight of the existing scientific evidence clearly demonstrates that when prairie potholes are drained or filled such that they can no longer fulfill functions such as water storage and water quality maintenance. As such, the physical, chemical and biological integrity of the receiving downstream navigable waters is negatively affected. The significant nexus they have as a result of "geographic isolation" is fundamentally altered when the basins are filled or drained via ditches and more directly linked to the downstream waters. The extent to which navigable waters are impaired depends upon the scale of the altered inputs, thereby reinforcing the importance of using an appropriate watershed, groupings of watersheds, and/or ecoregional scales to assess aggregate impacts. Again, we believe that Justice Kennedy's choice of the Gulf of Mexico's hypoxic zone as an example of the type of water quality issue that the CWA is intended to address should shed some light on the scale of the "region" that should be used to assess aggregate impacts. While we do not believe that he would consider the entire Mississippi River watershed as a reasonable basis for such determinations, we firmly believe that a single point of entry watershed is not only unwarranted on the basis of the science available for the PPR as a whole, this scale will in many cases be too small to appropriately and efficiently assess aggregate impacts of wetlands similarly situated within a region such that the objectives of clarity, certainty, and predictability are achieved. Thus, we again suggest that the level of the ecoregion is the best scale at which to examine many aggregated wetlands, such as the prairie potholes.

C. Texas and Southwest Louisiana Coastal Prairie Wetlands

The inland, freshwater wetlands of the coastal prairies of Texas and southwest Louisiana are contained within Level III ecoregion 34, "Western Gulf Coastal Plain." The region is a mosaic of low relief mounds, flats, and depressional wetlands (Moulton and Jacob 2000), and provides another good example of a situation in which it would make little sense to conduct significant nexus analyses for each single point of entry watershed. They are by-and-large aligned along the Gulf Coast, and are all very similar in their fundamental hydrogeomorphic and ecologic characteristics, strongly reinforcing the case for ecoregional analyses.

The wetlands across the region can be locally diverse, but their basic hydrology typically ranges from temporarily flooded to only rarely exposed, much like the prairie potholes. And, they typically occur in relatively high densities. Studying only a relatively small but typical portion of the ecoregion in a 200 mi^2 area near Galveston Bay, researchers counted over 10,000 non-riverine palustrine wetlands, with a median size of only 0.9 ac and 72% being less than 2.47 ac (Enwright et al. 2011). In the aggregate, the wetland basins and their catchments represented over 40% of the study area (Enwright et al. 2011). Like prairie potholes, most are geographically isolated, and are being lost relatively rapidly. In Harris County and the Houston area, 13% were drained or filled over a recent 10-year period (Jacob and Lopez 2005). This is a region and category of wetlands which the SAB September 30 letter to the EPA identified as being similarly situated "other waters" that in the aggregate have a significant nexus that affects the integrity of downstream navigable waters, and therefore should be considered jurisdictional waters of the United States. This landscape is also of considerable importance to waterfowl conservation, so we provide here a short review to highlight and complement the literature that appears in the draft Connectivity Report.

Gulf Coastal Prairie Wetlands: Hydrologic and Chemical Connectivity

In south Texas near Galveston Bay, coastal prairie wetlands are a prominent and important component of the landscape. Two recent studies (Forbes et al. 2010; Wilcox et al. 2011) showed that in the case of these coastal depressional wetlands that have often been considered "geographically isolated wetlands," intermittent surface water connections with the surrounding coastal jurisdictional waterways involved 17-18% of the precipitation falling on the watershed during the study period. Wilcox et al. (2011) demonstrated that the complexes of the wetlands that they studied here in fact exhibited a strong surface water connection with the waterways in the region, serving in effect as headwaters with intermittent but regular discharges to flowing waters and estuaries. Both studies concluded that much of the surface runoff entering the navigable Galveston Bay and other nearby waters likely passes through coastal prairie wetlands, and support the contention that their results can be generalized across the Texas Gulf Coastal Plain. Not only is the nexus between these wetlands and the coastal waters significant on the basis of the quantity of water flows, but Forbes et al. (2010) also found that these wetlands significantly affect the water quality of navigable waters by reducing incoming inorganic nitrogen by approximately 98%, and inorganic phosphorus by 92%. Thus, these wetlands are positioned within the hydrologic flow paths to serve as strong sinks for nitrogen and phosphorus and thereby provide substantial reduction of the pollution of runoff waters that ultimately enter the Galveston Bay estuary. The fixed carbon and nitrogen then exported from these wetlands to the navigable waters provides valuable food web support, thereby creating a biological nexus, as well. Forbes (2007) serves as a useful annotated bibliography for coastal prairie freshwater wetlands as the agencies synthesize the related science for the "other waters" within this ecoregion.

An important and broadly applicable point highlighted by these recent studies of Gulf coastal prairie wetlands is that in the case of at least some, and perhaps many, of the subcategories of "other waters" in ecoregions across the Nation, it is only recently that studies have been conducted to focus on the question of connectivity in the context of the legal issues raised by the recent Supreme Court cases. In the case of these Gulf coastal prairie wetlands, we have a relatively few focused studies that have nevertheless provided strong evidence of connectivity bearing upon their potential designation as "waters of the U.S." by rule. Based on the recent increased rate of research related to connectivity of the type necessary for evaluation of "significant nexus" determinations in the aggregate, we would anticipate a continued and important need to have a process through which new science will be able to be continually incorporated into the decision making process for what are being termed "other waters." Furthermore, this situation provides additional support regarding the benefits of applying the "weight of the evidence" approach at this important stage of the regulatory process to assess subcategories of "other waters" that could or should be designated as jurisdictional by rule, thereby aiding in providing clarity, certainty and predictability to all parties, and in making the process as efficient and pragmatic as possible.

<u>Gulf Coastal Prairie Wetlands: Biological Connectivity</u>

This region contains one of the best examples in which migratory birds serve as a strong indicator of biological connectivity that is fully consistent with the findings of the *SWANCC* decision and Justice Kennedy's language in *Rapanos* with regards to birds, and does not in any way resurrect the so-called "migratory bird rule" or the way in which birds were used pre-*SWANCC* to justify CWA jurisdiction.

First, it must be clear that the *SWANCC* decision did not say or imply that migratory birds were irrelevant to jurisdiction, but rather it simply found that use by migratory birds (i.e., in the fashion of the "migratory bird rule") could not be the sole basis for determining CWA jurisdiction. We accept the interpretation of the *SWANCC* decision that makes use by a *migrating* bird essentially irrelevant (setting completely aside the importance of many or most of these wetland areas to interstate and international commerce). But, in the context of assessing the biological basis for significant nexus, a *"migrat<u>ing</u>* bird" and a *"migrat<u>ory</u>* bird" are two very different things. "Migratory birds" represents a legal categorization of bird taxa that reflects their tendency to migrate between a breeding area and a wintering area, sometimes distant from one another. The U.S. Fish and Wildlife Service is legally responsible for maintaining the list of bird taxa that are considered "migratory species." Other bird taxa are considered resident or non-migratory species, and spend their entire annual life cycle within a relatively small region.

With the distinction between migrat<u>ing</u> and migrat<u>ory</u> birds in mind, we understand that, for example, the fact that a redhead duck (*Athya americana*) migrating from its breeding habitat in North Dakota stops for a short time at a wetland in central Iowa on its way to its wintering ground on the Texas Gulf Coast, cannot in and of itself be used to assert CWA jurisdiction over the Iowa wetland. However, when a migratory bird (a legal designation of a large category of birds, as opposed to resident or non-migratory species) like the redhead can be shown to be dependent upon *both* navigable waters and "other waters" *within* a season and within a relatively local or regional context, then the migratory birds should indeed contribute to the establishment of a significant biological nexus between the "other waters" and the navigable water.

Redheads and lesser scaup (*A. affinis*) during their wintering period provide excellent examples. Approximately 80% of the entire North American population of redheads winters in estuaries of the Gulf of Mexico, mostly in the Laguna Madre of Texas and Tamaulipas, Mexico (Adair et al. 1996; Ballard et al. 2010). They forage almost exclusively on shoalgrass (*Halodule wrightii*) in the hypersaline lagoon, which is a traditionally navigable waterway (Ballard et al. 2010). Large numbers of lesser scaup also winter in the Gulf Coast region, and generally forage on invertebrates in the saline and brackish marshes and offshore habitats of Texas and Louisiana (McMahan 1970). Large concentrations of diving ducks in the region, including these two species, must also make daily use of inland, coastal freshwater ponds in order to dilute and excrete the salt loads that are ingested while feeding in the saline habitats (Mitchell et al. 1992; Adair et al. 1996; Ballard et al. 2010). Activity budgets documented that redheads and scaup spent approximately 37% and 25% of their time, respectively, on the freshwater wetlands actively drinking (Adair et al. 1996). While both studies found that redheads and scaup tended to make greater use of wetlands in closer proximity to the coast when they were available, they flew farther inland when necessary during dry conditions to acquire freshwater because they require the freshwater to survive. Adair et al. (1996) found that redheads used wetlands up to 13 miles inland, and scaup used wetlands up to 33 miles from the coastal navigable waters. Thus, these researchers and others (e.g., Woodin 1994) concluded these migratory bird species are dependent upon *both* the navigable saline waters of the Laguna Madre and Gulf of Mexico, *and* the inland, geographically isolated freshwater wetlands, throughout the approximately 5-month wintering period. Therefore, if the inland freshwater wetland habitats, i.e., the “other waters,” are adversely impacted because of a lack of CWA jurisdiction, the region’s ability to support redhead, scaup and other diving duck populations is degraded, and the biological integrity of the traditionally navigable water of the Gulf of Mexico’s Laguna Madre would therefore be impacted. The dependency upon both the “other waters” and the navigable waters involved here therefore clearly constitutes a significant nexus that is fully consistent with the legal framework laid out by Justice Kennedy.

Gulf Coastal Prairie Wetlands: Economic Consequences Related to Hydrologic Connectivity

A series of studies around the Gulf Coast documented the direct, significant impacts of wetland drainage on actual flood damages based on real insurance costs. This is particularly relevant to examine here because the state of Texas consistently has more flood damage than any other state.

Brody et al. (2014) looked at an individual watershed within this ecoregion near Houston, and found that the presence of wetlands was the second-most important land-use-land-cover factor related to flood damages totaling $356 million over 11 years. Of all variables, being surrounded by wetlands had the strongest influence on reducing flood damages. Looking more broadly at a 37-county area along the entire Gulf coast of Texas between 1997 and 2001, Brody et al. (2008) found that alteration of wetlands was strongly correlated with flood damages. They noted that in areas with greater degrees of wetland loss, flood damages increased with a given amount of precipitation.

Brody et al. (2007a) conducted a similar examination of flood damage and wetland alteration between 1991 and 2002 over an even more expansive area that included all fourth-order HUCs within 100 miles of the coasts of Texas and Florida. Once again, they clearly demonstrated a strong relationship between wetland loss and alteration and increased flood damage. Importantly, they found that the cumulative effects of many small scale impacts to wetlands had a significantly greater effect on the level of flood damages than did larger, individual impacts. Brody et al. (2011) looked at more than $13 billion in insured property losses across 144 coastal counties in all five Gulf coast states (plus several counties in extreme southwest Georgia) over the 2001-2005 period. They again found that wetland alteration was a significant factor in explaining flood damages. Similar studies in Florida (Highfield and Brody 2006; Brody et al. 2007b) also demonstrated that flood-caused property damages significantly increased as a consequence of the degree to which naturally occurring wetlands were altered. Thus, this series of powerful studies convincingly demonstrated the direct economic consequences of failure to recognize the connectivity of many “other waters,” including geographically isolated wetlands, to downstream waters, and that the cumulative effect of many small, scattered wetland impacts to these wetlands are significant, oftentimes more so than individual larger impacts.

In summary, and in accordance with the conclusion expressed by the SAB in their September 30 letter to the EPA, the available science strongly supports the designation of the “other waters” classed as Gulf coastal prairie wetlands throughout this ecoregion, and in the aggregate, as jurisdictional by rule.

D. Nebraska’s Sandhill Wetlands

Ecoregion #44, the Nebraska Sand Hills, is the largest sand-dune area in the Western Hemisphere. This approximately 12 million-acre region of central and eastern Nebraska contains over 1,000,000 acres of sandhill wetlands (LaGrange 2005). The “other waters” in this region include approximately 177,000 acres of open water and marsh, i.e., permanently and semi-permanently inundated wetland, and 1.13 million acres of wet meadow, i.e., ephemeral and seasonal wetlands (Rundquist 1983). Sandhill wetlands range in size from less than an acre to 2,300 acres, but 80% are less than 10 acres (Wolfe 1984).

Ginsberg (1985) noted that although many of these wetlands and lakes appear to be geographically isolated wetlands, they are predominantly hydrologically connected to and represent an extension of the groundwater, particularly in the eastern and central sandhills and thereby supply base flows to the streams and other waters in the region. These sandhill wetlands developed as groundwater seepage areas in the valleys of wind-deposited sand dunes (Sidle and Faanes 1997). Rundquist et al. (1985) provided evidence of groundwater flow-through in a shallow lake, with the groundwater flowing toward Blue Creek, about 3 miles away. LaBaugh (1986) also documented interconnections and flow between sandhill wetlands and lakes and groundwater as water in this interconnected system flowed toward lower elevations. Novacek

(1989) stated that the sandhill wetlands in Nebraska (including wet meadows) are important to water table and aquifer recharge, with the region containing five principal drainage basins that all ultimately empty into the Platte and Missouri rivers. It has also been stated that most sandhill wetlands are also interconnected with the important Ogallala aquifer as well as the local groundwater (Tiner 2003).

Winter (1986) demonstrated that recharge of the groundwater was focused on depressions in the landscape (e.g., wetlands). Thus, in this region, the return of polluted water can enter the aquifer or regional watershed through these geographically isolated wetlands and degrade downstream water quality (Winter 1998). Winter (1998) stated that, "groundwater and surface-water interactions have a major role in affecting chemical and biological processes in lakes, wetlands and streams, which in turn affect water quality throughout the hydrologic system." Katz et al. (1995) demonstrated the ease with which changes in the chemistry of these types of "other waters" are transported and reflected in the water quality of groundwater. The extent of connectivity between the wetlands, groundwater and downstream flowing waters was provided by Chen and Chen (2004) when they documented that a very high percentage of the flow of the Dismal and Middle Loup rivers was supplied by groundwater. Further evidence of the connectivity with the groundwater is the presence of fens in the region (Steinauer 1995).

Tiner et al. (2002) indicated that most sandhill wetlands are interconnected with the local groundwater and the agriculturally important Ogallala, or High Plains, aquifer. Importantly, in terms of the issue of connectivity of the wetlands with downstream waters via groundwater, Weeks and Gutentag (1984) stated that groundwater from this aquifer discharges naturally into flowing streams and springs, and that the aquifer and valley-fill deposits and associated streams comprise a stream-aquifer system that links the High Plains aquifer to surface tributaries of the Platte, Republican and Arkansas rivers.

In summary, the scientific evidence is clear that the Sandhill wetlands are, in the aggregate and generally, connected via groundwater linkages to navigable waters and their tributaries in this region of the country. Thus, they should be strongly considered for designation as jurisdictional by rule.

E. Playa Wetlands, Rainwater Basins, and Platte River Region Wetlands

Playa Wetlands: The science of playas (sometimes referred to as "playa lakes") and related waters provides another excellent example of the types of linkages that can be used to demonstrate a significant nexus between even physically remote wetlands and navigable waters, in this case via critical groundwater connections.

Playas are relatively shallow, ephemeral, closed-basin wetlands usually not located adjacent to navigable waters (Fig. 12). They occur in high densities in several areas within ecoregion 27, the Central Great Plains, including the Rainwater basin region of Nebraska (see below) where its wetlands are very similar in structure and function to the playas that occur farther south. These shallow, typically circular basins lie at the lowest points in relatively low-relief watersheds, and each collects runoff from the surrounding area. About 66,000 playas remain in the relatively flat topographic landscape of the Great Plains of Kansas, Colorado, Oklahoma, Texas, and New Mexico (Playa Lakes Joint Venture http://www.pljv.org; Smith et al. 2012; Fig. 13). In Kansas, a recent study using improved techniques documented about double the number that had previously been estimated (new estimates of about 22,000 playas), and noted that more than 80% were smaller than 5 acres in size (Bowen et al. 2010). Playas tend to occur in clusters of high density in several distinct areas across the ecoregion, and are dominant components of the landscape in these areas (Bowen et al. 2010). For example, the total playa area in west Texas was estimated (Fish et al. 2000) to be almost 400,000 acres. Thus, given their numbers, distribution, and structural and functional similarities, the value of playas is most reasonably assessed in the aggregate across the landscapes in which they occur (Johnson et al. 2012; Smith et al. 2012).

The Ogallala (or High Plains) aquifer underlies about 170,000 square miles and is shared by eight states, including most of the playa region, as well as the Rainwater Basin area of Nebraska. This aquifer is the primary source of water in the region with about 97% being used to support irrigated agriculture (Maupin and Barber 2005), and the water has an economic value of approximately $20 billion (Moody 1990). The aquifer also provides drinking water for about 82% of the region's residents (Maupin and Barber 2005).

Conceptual models have recognized for years that the playas are critical recharge zones for the Ogallala (e.g., Wood 2000). Gurdak and Roe (2009; 2010) recently provided a comprehensive synthesis of the related literature (approximately 175 studies) and concluded that playas are pathways of relatively rapid recharge and provide an important percentage of recharge to the Ogallala aquifer. Thus, playas are, in the aggregate, critical to supplying water to an important, interstate water body, and they therefore impact the water quantity of the underlying aquifer (Gurdak et al. 2009; 2010). Furthermore, Rainwater and Thompson (1994) stated that landscape changes increased water collection in playas and that infiltration had also increased. They further stated that these factors increased the contribution of playas to Ogallala aquifer recharge and that, in some areas, infiltration from playas that receive runoff are the principal source of aquifer recharge.

Understanding that the CWA has no jurisdiction over groundwater, the importance of the aquifer to human health, welfare and economic benefit is therefore not a direct, independent concern of the Act except as it is affected by the condition of surface water and wetlands and in turn as it impacts waters to which the aquifer discharges. For example, Weeks and Gutentag (1984) stated that groundwater from this aquifer discharges naturally into flowing streams and springs, and that the aquifer and valley-fill deposits and associated streams comprise a stream-aquifer system that links the High Plains aquifer to surface tributaries of the Platte, Republican and Arkansas rivers, as well as the Pecos and Canadian rivers (Kreitler and Dutton 1984). Further strengthening documentation of the linkage of wetlands, groundwater, and flowing navigable waters, Slade et al. (2002) showed that channel gain or loss in Beals Creek (draining into the Colorado River basin of Texas) corresponded to discharges from or recharges to the Ogallala aquifer. Thus, the significant nexus between the playa wetlands and navigable waters is created by their direct linkage via the Ogallala aquifer.

In addition to the impact that playa wetlands have on the quantity of water moving from the wetlands, through the aquifer, and to navigable waters, they also have an impact on the quality of that water. Ramsey et al. (1994) showed that playa wetlands improve the water quality of storm runoff, demonstrating that water quality in the playa is better than that found in storm runoff before entering the wetland. They stated that this wetland function thereby contributes to improving/maintaining groundwater quality in the aquifer, as would be predicted in light of playas being the principal source of aquifer recharge in some areas (Rainwater and Thompson 1994). Thus, as a result of the relationships with navigable rivers in the region (Weeks and Gutentag 1994), playas must also improve water quality in those streams and rivers.

Hence, impaired water quality functions of playas would have adverse impacts on the quality of water in the aquifer and linked navigable waters. Increased agricultural application of nitrate fertilizers makes the groundwater more vulnerable to nitrate contamination (Gurdak and Roe 2009) via playa recharge. Belden et al. (2012) found that the water in many playas sampled in Nebraska, Colorado, Texas and New Mexico contained elevated levels of pesticides, particularly herbicides. Given the linkage of playas to the Ogallala, the potential impacts of what might be deposited in the playas to the groundwater and then transferred to the receiving waters of the aquifer's discharge are clear. In addition, as a result of relatively slow recharge rates, the limited ability of the aquifer itself to attenuate contaminants such as nitrates, and the prolonged travel times of aquifer water, any potential contamination would have very long duration (Gurdak and Roe 2009) even if corrective action were taken. Thus, the natural denitrification function of intact playas takes on added significance in relation to the quality of water in the aquifer, and ultimately, to its interconnected flowing waters.

Rainwater Basin and Platte River Region Wetlands: The Platte River and Rainwater Basin region of central Nebraska is an inland situation that should be examined in more detail. The Platte River and its major tributaries transect ecoregions 25 (High Plains) and 27 (Central Great Plains), and the Rainwater basin region is in ecoregion 27, along with most of the playas (see above). In addition to the previously discussed documentation and acceptance of the fact of the hydrologic connectivity between the Platte River, its tributaries, and "other waters" in the region, Chen (2007) noted that the river, alluvial aquifer, and the riparian zone all form a well connected hydrologic system. He additionally indicated that water in streams there may come from shallow or deep aquifers depending on evapotranspiration rates, further indicating the connectivity of the components of the aquatic system there.

Millions of waterfowl migrate through the region every year and concentrate in the small percentage of the region's remaining wetlands (approximately 5%) that provide habitat, particularly in the spring. In addition, nearly the entire population of mid-continent sandhill cranes (*Grus Canadensis*; ~500,000 birds) stages there (Krapu et al. 1982; Vrtiska and Sullivan 2009), and it is an important concentration site for the federally endangered whooping crane (*G. americana*; Austin and Richert 2005). Although this region is a migration and staging area for the crane species, the situation requires further examination because huge numbers of the sandhill cranes, and non-negligible percentages of the whooping crane, roost at night by standing in the very shallow waters of the Platte River (along about 65 miles of its length in central Nebraska), but they leave the river to use other habitats for feeding and loafing during the day. While the sandhill cranes feed predominantly on waste grain in crop fields (Krapu et al. 1984; Davis 2003; Anteau et al. 2011), the whooping crane spends more time in palustrine wetland habitats (Austin and Richert 2005). Austin and Richert (2005) analyzed habitat use from 1977-99, but did not appear to directly review their data relative to the question of the degree of dependence of whooping cranes on both the riverine habitat and the freshwater wetlands in the sense required to firmly establish a significant nexus as currently proposed.

Folk and Tacha (1990) documented patterns of use of the North Platte River and the region's temporary and semipermanent palustrine wetlands by sandhill cranes. The North and Central Platte River valley provides the primary spring staging habitat for about 80% of the entire midcontinent population of the species (Pearse et al. 2010), and the cranes typically roost in the river channel or nearby wetlands for safety during the night. They found that the cranes were collectively interdependent upon the shallow navigable river and the region's wetlands, providing a biological nexus between the two types of waters. Taken together, these and other studies (Gersib et al. 1989; Tacha et al. 1994; Bishop et al. 2010; Pearse et al. 2011) indicate that the Platte River and the wetlands of the rainwater basin and surrounding landscape function as a complex of aquatic habitats for a diversity of species, and as the "other waters" of the region are negatively impacted, so too is the biological integrity of the navigable Platte River.

Thus, playa wetlands, as well as the Rainwater basin wetlands, provide strong evidence of the kinds of linkages (often via important groundwater bodies) and relationships between "other waters" and downstream or navigable waters that can inform significant nexus analyses of aggregated wetlands in these and other regions of the country.

IV. <u>Significant Nexus: Additional Science-based Comments Regarding Connectivity</u>

Because Ducks Unlimited has over time focused its conservation efforts and developed its expertise in some regions more than others in relation to their relative importance to waterfowl conservation, our preceding analyses have concentrated most on those regions. However, as is evident from the Connectivity Report and the draft report of the SAB's special panel on connectivity, the scientific literature clearly documents that many other wetlands and wetland subcategories falling within the proposed rule's "other waters" classification have similar types of significant nexuses with downstream navigable waters. The remainder of our comments will highlight some of the science regarding the existence, geographic extent, and general pervasiveness of those avenues of significant nexus. We have primarily organized this additional information by hydrologic and ecologic functions, and divide our contributions into the four categories of "*Surface water storage and flood abatement*," "*Groundwater recharge and base flow maintenance*," "*Water quality relationships*," and *"Biological nexus."* It should be clear from the regional examples cited above, however, that these individual wetland functions and avenues of significant nexus can and do interact in important ways.

Obviously, we will not attempt to duplicate the exhaustive amount of work that went into reviewing and synthesizing the well over 1,000 scientific publications synthesized within the Connectivity Report and, importantly, the report of the SAB's special panel on connectivity. Instead, our intent in providing these additional comments regarding the significant nexus of "other waters" with downstream navigable waters is to encourage and provide support for the agencies' consideration to several key points.

First, we desire to contribute additional science and science-based perspective to the work that the agencies have already conducted, that will be added to by the public comments, and ultimately further synthesized in the form of the final rule. We also want to provide further encouragement to the agencies to use a "weight of the evidence" approach in making decisions regarding how "other waters" will be treated in the final rule. Our earlier comments offer what we believe is a compelling, multifaceted rationale for using that conceptual framework as the foundation for distilling the existing and emerging science into the final rule. However, we believe that, in addition to the science already presented, while not focused on particular regions, the following additional science and comment should help to foster a greater understanding of the breadth and general degree of linkages that exist to demonstrate a "nexus" between almost all "other waters" and downstream navigable waters. And finally, we hope to help convey a sense of the scientific reality that the cumulative effect of many small, scattered, seemingly isolated impacts to "other waters" ultimately has an impact on downstream navigable waters that can only be considered significant, as evidenced by the current state of the Nation's waters being a reflection of the past cumulative degradation and loss of "other waters."

A. <u>Surface Water Storage and Flood Abatement</u>

Wetlands in any watershed, including "other waters," serve a critical function in storing and holding water and associated pollutants (including sediment) that otherwise would flow more rapidly and directly toward navigable waters. Thus, wetlands play a significant role in local and regional water flow regimes by intercepting storm runoff and storing and releasing those waters over an extended period, either through surface or groundwater discharges (Mitsch and Gosselink 1986). Floods continue to be the most economically significant natural hazard in the U.S., and have a significant negative impact on national, regional, and local economies, as well as taking a toll on human life, health, and general welfare.

We again encourage the agencies to carefully review Blann et al.'s (2009) thorough review of the effects of surface and subsurface drainage on aquatic ecosystems (>400 citations). They make an important contribution by collecting and effectively synthesizing information that relates to the effects of drainage, often involving either existing or former "other waters," on the chemical, hydrologic and physical, and biological integrity of downstream waters. Their synthesis underscores the significance of the cumulative impacts of the upstream alterations of water bodies.

Another recent paper (McLaughlin et al. 2014) specifically examined geographically isolated wetlands from the standpoint of the current "significant nexus" context. They added to the many others who have found that these kinds of "other waters" moderated the frequency of both very high and very low water tables, and they also buffered stream base flows, thereby exhibiting a significant nexus with flowing waters. This functional connection between geographically isolated wetlands and navigable waters reduces the risk of downstream interests to flood hazards, and also reduces the erosion of stream banks and sediment movement and the physical, chemical, and biological consequences of those alterations to downstream hydrology. Additionally, groundwater exchange is controlled more by wetland perimeter than surface area, indicating the importance of many small wetlands. Importantly, their modeling work verified that given the same surface area of wetlands, landscapes with many small wetlands had more "capacitance" than landscapes with fewer large wetlands. They conclude that a significant nexus exists as a consequence of the influences of these "other waters," in the aggregate, on regional water tables and regulation of base flows.

The presence of wetlands in watersheds was found to be a significant factor in the reduction of 50- to 100-year floods (Novitzki 1978). In Wisconsin, Illinois, and the northeast U.S., wetland area within watersheds has been shown to be positively correlated with reduction in peak flows (Novitzki 1978; Novitzki 1982; Novitzki 1985; Demissie et al. 1988; Demissie and Khan 1993). Johnston et al. (1990) modeled the relationship between wetland flood storage and flood peak reduction and found that in watersheds with a wetland area of less than 10%, major effects on flood flows were associated with small additional losses in wetland area.

The decrease of 80% of the storage capacity of the Mississippi River floodplain as a result of levees and loss of forested and other wetlands (Gosselink et al. 1981) is widely considered an important contributing factor to the increasing frequency of flooding along the Mississippi River (Belt 1975). Hey et al. (2004) calculated that restoring 4 million acres of former wetlands in the Mississippi River floodplain could create approximately 16.5 million acre-feet of flood storage. Conversely, the loss of existing wetland acreage in the floodplain and watershed would increase flood flows on this navigable river. An increase in discharges from agricultural landscapes, at least in part due to wetland drainage, has been shown to be a primary contributing factor in carbon, nutrient, and pesticide exports to the Gulf of Mexico (Raymond et al. 2008).

Studies in landscapes with other types of non-proximate wetlands have similarly demonstrated that drainage of wetlands and other areas results in increased peak flows in navigable waters and their tributaries (Skaggs et al. 1980; Allan 2004). Ogawa and Male (1983) employed a hydrologic simulation model to demonstrate that for relatively low frequency floods (those occurring with 100-year interval or greater which are also those with the greatest potential for catastrophic losses) the increase in peak stream flow was very significant for all sizes of streams when wetlands were removed from the watershed. Brody et al. (2007b) analyzed 383 non-hurricane flood events in Florida, and their results suggested that property damage caused by floods was significantly increased by alteration of naturally occurring wetlands. Many or most of these floods were presumably in association with jurisdictional waters.

As with USDA programs in the PPR, Duffy and Kahara (2011) showed that wetlands restored by the Wetland Reserve Program in the Central Valley of California provided flood storage of 113 billion cubic feet in 2008. They also documented that, in the aggregate, that the palustrine, riparian, and vernal pool wetlands in the region provided flood storage of 4159, 2182, and 2140 cubic meters, respectively. Clearly, loss of wetlands in this region would ultimately increase flood flows in navigable rivers like the Sacramento and San Joaquin.

Viewed on the whole, studies like these provide examples of the general importance of wetlands in flood attenuation. The aggregate contributions of individual wetlands distributed across a regional landscape, and often located within topographically higher portions of the watershed and non-proximate to other jurisdictional waters, can nevertheless exert a very significant effect on flood volumes. Thus, many seemingly geographically isolated wetlands are in fact adjacent in functional sense, and exhibit a significant nexus with navigable waters that are clearly jurisdictional from the perspective of the Clean Water Act and federal interests such as flood and pollution control.

B. <u>Groundwater Recharge and Base Flow Maintenance</u>

Attention is being increasingly focused on the growing problems associated with rapidly increasing use and diminishing supply of groundwater resources in many areas across the U.S. (Russo et al. 2014). That being the case, the development of the final rule should keep in mind the role that surface wetlands, particularly "other waters," play in the recharge of groundwater that very often also discharges to flowing waters.

There is a much greater degree of linkage between wetlands, including aggregations of wetlands classed as "other waters," and navigable waters via groundwater connections than is generally appreciated. As stated earlier, significant nexus analyses and functional adjacency should be considered in hydrologic and ecologic contexts, not merely within a physical or geographic one, in order for the regulatory environment to adequately address the stated purposes of the CWA and intent of Congress. Wetlands very often contribute to groundwater recharge, and this groundwater then continues to move downslope toward flowing streams and rivers, thereby ultimately contributing water to jurisdictional waters (Ackroyd et al. 1967; Winter et al. 1998).

Winter (1998) provided a good overview of the interconnections between streams, lakes, and groundwater systems. He concluded, "Groundwater interacts with surface water in nearly all landscapes," and provided examples from glacial, dune, coastal, karst, and riverine systems regarding these interactions. Hayashi and Rosenberry (2002) also reviewed these almost universally prevalent significant nexuses and cited many examples, coming to the same conclusions as Winter (1998). Woessner (2000) provided an overview of the interactions between groundwater and flowing waters in a fluvial plain setting, and highlighted the significant potential that exists for pollution of surface waters, such as jurisdictional waters, if groundwater becomes contaminated. (See later discussion for more on this topic.) Sloan (1972) stated that water seepage to groundwater was greater for ephemeral and temporary wetlands than for other wetland types. Other review papers and individual studies typically demonstrate that not only do connections almost always exist between wetlands, groundwater, and streams and rivers, but also that these interconnections are usually complex.

Gonthier (1996) documented the linkage and flow of water between an extensive bottomland hardwood wetland in Arkansas (a Ramsar-designated Wetland of International Importance), local flow of groundwater, and the Cache River up to ~2 miles away. However, the farther the wetland from the river, the more likely the water from the wetland was to enter groundwater flowing to the deeper Mississippi Alluvial Valley aquifer which discharges flows to major navigable rivers, including the Cache, White and Mississippi.

Flow of water and its chemical constituents from wetlands, via groundwater, to the water of the Great Lakes is extensive and important and has been frequently documented. Doss (1993) examined a coastal wetland complex in Indiana on the south shore of Lake Michigan and found strong hydrologic connectivity between the many interdunal wetlands and the lake, noting groundwater discharge to Lake Michigan was the only significant loss of water from the wetlands besides evapotranspiration. Holtschlag (1997) evaluated Michigan's entire Lower Peninsula, and estimated that groundwater discharge constituted 29.6 to 97.0% of the annual percentage of stream flow in the region. While he did not evaluate wetland interactions with groundwater *per se*, there presumably is significant recharge of the groundwater from wetland basins in the region, although this will require further review of data from the region to verify. Holtschlag and Nicholas (1998) estimated that 67.3% of stream flow in the Great Lakes basin is groundwater discharge, and represents 22-42% of the Great Lakes water supply, its largest component. A significant portion of this groundwater is likely the result of recharge from wetland basins. In Wisconsin, groundwater flow into Lake Michigan is between 7 and 11% of the river flow, a significant part of the lake's total water budget (Chekauer and Hensel 1986).

In the case of vernal pools in California, Hanes and Stromberg (1996) reported that wetlands with discontinuous or a weakly developed hardpan had high rates of seepage and therefore contributed to subsurface flow. Tiner et al. (2002) stated that during the wet seasons these geographically isolated wetlands formed hydrologically linked complexes that could drain into perennial streams.

"Other waters" that exist in karst topography are often directly linked to subsurface water flows of relatively high velocity, moving easily through underground channels, caves, streams, and cracks in the rock. There tend to be many springs and seeps, many with surface connections, which are the source of some large streams (Winter et al. 1998), and Winter (1998) stated that groundwater recharge in karst terrain is efficient. Entire streams can go subsurface and reappear in other areas and connect directly with wetland basins, and contaminants deposited in "other waters" are easily mobilized in these regions.

In addition to the direct hydrologic connections that exist between groundwater and streams, the nature of the groundwater discharge to streams can have impacts such as influencing benthic productivity (Hunt et al. 2006). The nature of recharge from wetlands to this pool of groundwater can therefore create an even more complex significant nexus between wetlands and navigable waters as a result of the interacting hydrologic, chemical, and biological relationships.

Clearly, demonstrated linkages between wetlands, groundwater and navigable waters within a broad variety of wetland categories and across a diversity of landscapes and regions, indicate that adjacency and significant nexus should be interpreted from a functional perspective if water quality is to be protected as intended by the CWA.

C. <u>Water Quality Relationships</u>

The importance of the relationships between wetlands and the water quality of navigable waters is central to an informed understanding of what should constitute jurisdictional wetlands under the CWA. It is well established that wetlands of all types have the capability to improve water quality by trapping, precipitating, transforming, recycling, and/or exporting many of its chemical and waterborne constituents (van der Valk et al. 1978; Mitsch and Gosselink 1986). Wetlands serve as a natural buffer zone or filter between upland drainage areas and open or flowing water. They can improve water quality by removing heavy metals and pesticides from the water column, and by facilitating the settling of sediment to which many pollutants are attached.

Wetlands remove excess nutrients, e.g., phosphorus and nitrogen compounds, by incorporating them into plant tissue or the soil structure and by fostering an environment in which microbial and other biological activity pulls these compounds out of the water, thereby enhancing water quality.

Importantly, water quality contributions by wetlands can occur no matter where the wetland occurs on the landscape, and "other waters" also serve as chemical and nutrient sinks, trapping and holding these compounds (Mitsch and Gosselink 1986; Mitsch et al. 1999). Retention time, obviously prolonged when waters flow into a wetland before leaving via surface runoff or through infiltration into subsurface groundwater that flows to a river, has been shown to be the most important factor in promoting nitrogen processing (Jansson et al. 1994). For example, when water naturally filters through Delmarva bays (a category of geographically isolated wetlands) instead of being circumvented through drainage canals to a navigable water, it flows through groundwater pathways to the Chesapeake Bay with much of its nitrogen having been removed (Laney 1988; Shedlock et al. 1991; Bachman et al. 1992; Fretwell et al. 1996). Nitrogen is one of the principal pollutants of concern in the waters of the Chesapeake Bay, and in many other waters that supply domestic, municipal, irrigation and commercial needs. In Michigan, Whitmire and Hamilton (2005) concluded that a remarkably small area of wetland can strongly influence water quality relative to nitrate and sulfates. Some of their study wetlands were connected to the groundwater system. In Lake Michigan and Lake Huron, the biota associated with wetlands near outlets from agricultural drainage systems was different than that of coastal wetlands not close to such outlets (Schock et al. 2014). These differences were associated with increased levels of nitrates, turbidity, and other chemical characteristics of the drainage water, thereby providing another example of the impacts related to upstream drainage of "other waters" that could have intercepted and improved water quality.

Lin and Terry (2003) demonstrated that wetlands in California were able to remove an average of 69% of the selenium contained within agricultural runoff they received, thereby providing a natural mechanism for reducing the availability of this trace element which becomes toxic if bioaccumulated in the food chain. Weller et al. (1996) demonstrated that riparian wetlands of all types in eight watersheds of Lake Champlain were important in reducing phosphorus loading of surface waters.

With increased flows being a direct result of wetland drainage and artificially increased connectivity with downstream waters, those increased flows in turn increase stream incision, the rate and nature of channel evolution, and the rate of erosion and sediment transport (e.g., Simon and Rinaldi 2006). Bellrose et al. (1983) and Mills et al. (1966) also described how sedimentation and stream bank erosion have created navigation and ecological problems on the Illinois River. One group of researchers stated that "discharge is a master variable that controls many processes in stream ecosystems" (Doyle et al. 2005). While recognizing the variability in response to increased or decreased flows, they categorized the impacts as affecting (1) transport,

(2) habitat, (3) process modulation, and (4) disturbance. Thus, again, unregulated wetland losses that alter discharges and flow regimes of receiving waters would in turn result in alter the integrity of downstream navigable waters.

Fennessy and Craft (2011) examined the relationships of Farm Bill wetland conservation programs to nutrient and sediment loads contributed by the entire Glaciated Interior Plains, (encompassing much of a seven-state area from Minnesota to Ohio) to the Mississippi River and Gulf of Mexico. Wetlands involved included about 260,000 acres of a variety of wetland types scattered throughout the region. They estimated that these wetlands reduced the region's contribution of nitrogen, phosphorus, and sediment to the Mississippi River by 6.8%, 4.9%, and 11.5%, respectively. Given that excess nitrogen is widely accepted as the primary cause of the hypoxic zone (Moreau et al. 2008), these wetlands clearly exhibit a significant nexus and provided significant benefit to the Mississippi River and Gulf of Mexico. However, it is important to recognize that if analyzed on the basis of only single point of entry watersheds, they would likely not have been determined to be jurisdictional wetlands, and this benefit to the Mississippi River and Gulf would be lost if those waters were significantly impacted by the draining or filling of the wetlands. A disproportionately high percentage of the nitrate load that the Mississippi River exports to the Gulf of Mexico comes from this region (Hey 2002), with the loss of wetlands and their cleansing role from across the landscape being a significant factor (Hey et al. 2012). Donner et al. (2002) stated that increased nitrate export to the Mississippi River between 1966 and1994 involved an increase in drainage and runoff from across the landscape. Wetlands falling into the "other waters" class in the proposed rule would have been able to intercept, retain, and process a significant portion of this water before it flowed to the Mississippi River had the wetlands been protected and retained on the landscape. In turn, the increased level of nutrients in the increased discharge from the river into the Gulf of Mexico is the major driver in the annual development of the hypoxic zone there, a process which is operating within the Chesapeake Bay, as well (Diaz and Rosenberg 2008).

In an analysis of USDA programs in California's Central Valley, Duffy and Kahara (2011) calculated that wetlands restored via the Wetland Reserve Program in the valley could improve the quality of incoming water by removing substantial amounts of nitrate-nitrogen, thereby benefiting and exhibiting a significant nexus with downstream receiving waters.

Human-induced eutrophication of lakes and rivers is a growing issue across the U.S., with total nitrogen and total phosphorus for all EPA nutrient ecoregions exceeding reference median values (Dodds et al. 2009). In light of the scientific evidence, it is evident that loss of wetlands in the "other waters" class, in the aggregate, has played a significant role in this long-term trend.

There is a vast body of scientific literature dealing with the relationship of wetlands (including many that are "other waters") and water quality, and the literature cited above is only a small sample of what is available on the topic. Many studies, as indicated above, also document widespread and direct physical linkages between the water contained in wetlands, groundwater, and flowing waters and tributaries considered "waters of the United States." However, taken as a whole, it provides compelling evidence that to protect the Nation's water quality, as intended by the CWA and amendments, the aquatic resources that together comprise an interconnected system must be protected. Further, this body of information affirms that the definition of adjacency and significant nexus must be evaluated from within a context of wetland and water quality *functions*, not simply physical proximity. As Whigham and Jordan (2003) concluded in a review paper, from a water quality perspective, "so-called isolated wetlands are rarely isolated" from other "waters of the United States."

Human Health Issues: A few examples of pollution of waters are informative regarding the risks associated with failing to recognize the significant nexus that exists between "other waters," groundwater, and navigable waters, and failing to view them as a single system relative to determining CWA jurisdiction. Additionally, from the standpoint of interpreting these risks, some examples of "artificial" waters nevertheless serve as instructive surrogates for the potential water-borne pollution pathways for natural wetlands.
For example, Ryan and Kipp (1997) assessed the impact of liquid wastes discharged from an enriched uranium recovery plant to evaporation ponds in Rhode Island. They identified chemical and radioactive constituents that infiltrated from the ponds to the groundwater aquifer, creating a plume that ultimately discharged into the Pawcatuck River.

Superfund sites offer many examples of the hazards associated with the pollution of non-proximate waters, whether natural or artificial, to navigable waters. In Macomb County, Michigan, at a 100-acre site at which effluent from a waste oil reclamation facility was held in ponds (EPA Superfund ID No. MID980410823), groundwater was found to be contaminated with volatile organic compounds which flowed toward business and residences, causing residents to use bottled water for potable purposes. Fish collected in the nearby Clinton River had elevated PCB levels. The Vertac site in Arkansas (EPA RCRA ID No. ARD000023440) involved the contamination of an aquifer with dioxins, furans and other chemicals that eventually contaminated Bayou Meto, a traditionally navigable waterway. White and Seginak (1994) documented that as a result of the dioxins and furans in Bayou Meto, wood ducks breeding there experienced suppressed nest success, hatching success, and duckling production. Teratogenic effects, such as crossed-bills, were documented at the sites with the highest levels of contamination. Similar situations of contamination of navigable waters as a result of linkages to "other waters" and groundwater are unfortunately not uncommon.

More recently, concerns have arisen over coal ash settling ponds and their nexuses to navigable and other waters. At a site adjoining Lake Michigan and the Indiana Dunes National Seashore in northwest Indiana, Cohen and Shedlock (1986) noted elevated levels of boron, arsenic, and molybdenum in groundwater associated with a coal ash pond. Subsequent to the 1.1 billion-gallon ash release from holding ponds in Tennessee, the Gibson plant in Indiana came under increased scrutiny as a result of boron concentrations (reported to cause nausea and diarrhea, among other potential adverse health effects) increasing in drinking water wells of East Mount Carmel (www.courier-journal.com February 23, 2009). Significantly elevated concentrations of selenium (teratogenic and toxic at high concentrations) in an associated cooling lake caused a closure to public fishing and raised concerns about nesting endangered least terns. Our understanding is that the EPA has been assessing the risks associated with coal ash more closely. While the question of the level of hazard associated with coal ash is not directly at issue with respect to the CWA, we encourage the EPA to look to those situations as examples of "artificial other waters" waters that can provide information and perspectives on the relevant question of the types and pervasiveness of avenues of significant nexus between "other waters" and downstream waters that exists across the country.

Finally, harmful algal blooms are an increasing water quality problem that clearly has significant human health and economic implications (Falconer 1999; Dodds et al. 2009). This problem has been exacerbated by the loss of the many, often small, isolated wetlands from across the landscape which, when protected, sequester nutrients (phosphorus and nitrogen) that lead to the unnatural blooms. High phosphorus loading is primarily responsible for the resurgence of algal blooms in Lake Erie (International Joint Commission [IJC] 2014). Much of the phosphorus input comes with runoff during spring snowmelt and heavy precipitation events (IJC 2014) draining agricultural areas south of the west end of the lake in Ohio. And perhaps not coincidentally, Ohio has lost more of its wetlands (90%) than any other state except California (91%; Dahl 1990). It is a reasonable presumption that many of those wetlands would have been classed as "other waters" and if they were still on the landscape they would have intercepted some of that runoff and processed the nutrients it contained, thereby benefitting the integrity of Lake Erie.

D. Biological Nexus

As is the case with respect to wetlands and water quality, there is also a vast literature regarding the significance of wetlands of the United States to fish, wildlife, amphibians, and other biota of the country and the continent. However, the primary question with respect to the draft guidance is to what extent biological information can be used to contribute to the establishment of a significant nexus between wetlands and jurisdictional waters. In addressing the issue from that perspective, we will continue to focus our attention on "other waters."

Leibowitz (2003) pointed to the need for examples of organisms that require both navigable waters and "isolated" wetlands, and we agree that additional effort should be placed on identifying such linkages. Nevertheless, even for "other waters," we can highlight a few important examples.

Changes to flow regimes of navigable waters that result at least in part from degradation and loss of "other waters" also have a direct impact upon the biota of navigable waters. Some species, for example, can be eliminated as a direct consequence of flows that are increased in magnitude and/or frequency (Allan 2004). Conversely, lower base flows that result from wetland drainage and reduced infiltration to the subsurface water that discharges to navigable waters also have a direct effect on the habitability of the latter for many taxa.

Numerous studies of amphibians have documented that the loss and degradation of "other waters" can affect population size, distribution, and movement as a result of the cumulative impact of the loss of "other waters" (e.g., Rittenhouse and Semlitsch 2007; Schalk and Luhring 2010; Scott et al. 2013; McIntyre et al. 2014). Where these populations and effects occur in conjunction with navigable waters, the biological integrity of the navigable waters would therefore be impacted by the impacts to the "other waters."

In addition to the redhead and scaup example on the Texas Gulf Coast and other previously cited examples, other avian species spend significant time daily on saltwater (navigable) habitats and are similarly dependent upon the presence of regional freshwater wetlands for purposes of osmoregulation (Woodin 1994). We emphasize that these examples all apply to *within*-season, local/regional habitat use, and do *not* include the period of migration. Some examples of such species include: American black ducks (*Anas rubripes*) in the northeast and mid-Atlantic coast and Chesapeake Bay that also depend upon inland freshwater wetlands (see Morton et al. 1989); California gulls (*Larus californicus*) using hypersaline Mono Lake and freshwater wetlands in southern California (Mahoney and Jehl 1985); and white ibises (*Eudocimus albus*) using estuarine rookeries and requiring freshwater wetland-derived prey for osmoregulation (Bildstein et al. 1990).

Tens of thousands of waterfowl winter on and near the Great Salt Lake (Vest and Conover 2011), and some, such as northern shovelers (*Anas clypeata*) and green-winged teal (*Anas crecca*), feed on invertebrates (brine shrimp and brine flies) in the lake. However, both species are dependent upon the availability of freshwater wetlands for osmoregulatory purposes in order to use the food resources and habitats of the Great Salt Lake (Aldrich and Paul 2002). Thus, a diminishment or degradation of the freshwater wetlands in the vicinity of the lake would translate to a diminishment of the biological integrity of the navigable lake. Unfortunately, the research has not yet been conducted that would clearly show how distant those two species would fly daily to make use of freshwater wetlands.

We believe that, as shown clearly by the examples of the redheads and lesser scaup on the Gulf Coast, the dependence upon *both* navigable waters and "other waters" constitutes a significant nexus. In these cases, without the wetlands, the species would not occupy the region and the biological integrity of the navigable waters would therefore be impacted. Within-season use of both categories of waters as seen in the examples of other migratory (not migrating) birds demonstrates similar dependency and a similar nexus. This interdependence on both navigable and "other waters" should be given the same consideration for establishing a significant nexus as would the dependence upon adjacent wetlands and riverine habitats by an amphibian species, for example. Although the scale is different, they are scientifically and biologically analogous, and there is nothing in the *SWANCC* or *Rapanos* decisions that would justify disallowing the use of this kind of situation (e.g., redheads) as a basis for the biological nexus that Justice Kennedy described.

V. <u>Some Economic and Social Considerations</u>

Although not directly linked to the issue of the technical substance of the draft guidance, the economic and social implications of restoring protection to wetlands and other waters and of striving *"to restore and maintain the chemical, physical, and biological integrity of the Nation's waters"* should provide important context within which the final rule is developed. There are significant economic and societal implications if protection of the Nation's water quality and wetland conservation continue to be compromised.

In the context of documenting connectivity between other waters and navigable waters, the discussions above essentially focus on some of the primary functions of wetlands, all of which provide valuable services to our society and the economy. Costanza et al. recently (2014) updated earlier estimates of the total global value of ecosystem services provided by a number of major ecosystems. They estimated that the value of those services for "inland wetlands" averaged $25,682/ha/yr, significantly higher than their 1997 estimates, in part because of the continued loss of those wetland habitats. Interestingly, the value of the services provided by the navigable waters themselves (included within "rivers and lakes") averaged only $4,267/ha/yr. In the U.S., every sector of the economy, and every individual person, is affected by the economy of water in various ways (EPA 2013). The water systems that supply 86% of the U.S. population with household water, for example, involves at least $53 billion a year (EPA 2012) even though domestic water supplies accounted for only 12% of off-stream use of water in 2005 (EPA 2013).

Focusing on economic issues more directly related to conservation interests, the outdoor industry contributes an estimated $730 billion to the Nation's economy, and fish and wildlife-related recreation (hunting, angling, and wildlife-watching) accounts for $122.3 billion in annual expenditures (U.S. Fish and Wildlife Service 2006), and is a major industry. A high percentage of that economy is associated with water resources. Waterfowl alone represents a tremendously valuable interstate and international economic resource. In 2006, more than 1.3 million waterfowl hunters expended approximately $900 million with a total related industry output of $2.3 billion (Carver 2008). This analysis also calculated that waterfowl hunting created approximately 28,000 jobs in 2006. Birding, much of it also water-related as evidence by waterfowl accounting for the type of bird observed by 77% of away-from-home birders, supported total trip-related and equipment expenditures of $36 billion in 2006 (Carver 2009). These direct expenditures resulted in a total industry output of $82 billion and created 671,000 jobs (with an average annual salary of $41,000; Carver 2009). The total economic contribution of fishing, obviously dependent upon water resources, is $61 billion (American Sportfishing Association 2002). These economic benefits of water resources simultaneously accrue to the states, as indicated by the example of Texas in which the expenditures by migratory bird hunters and wildlife watchers totaled $1.3 billion in 2001 (U.S. Fish and Wildlife Service 2002), a level of expenditure that when compared to the state's agricultural commodities would rank second behind only cattle and calves (http://www.ers.usda.gov/statefacts/TX.htm).

The issue of the negative economic consequences of increased flooding associated with a reduction in the flood storage capacity of wetlands in the Nation's watersheds was touched upon earlier. Another indication of the economic implications of protecting the Nation's water resources is revealed in the example of the actions taken by New York City to initiate a $250 million program to acquire and protect up to 350,000 acres of wetlands and riparian lands in the Catskill Mountains (Daily et al. 1999). The city viewed this as a way to protect the quality of its water supply as an alternative to constructing water treatment plants which could cost as much as $6-8 billion. In South Carolina, a study showed that without the wetland services provided by the Congaree Swamp, a $5 million wastewater treatment plant would be required (www.epa.gov/owow/wetlands 2003). Thus, wetlands provide low cost services to society, as well as reducing costs of infrastructure and long-term maintenance.

The algal blooms that cause health problems also come at high economic costs. For example, Dodds et al. (2009) estimated that the total annual cost of the eutrophication of U.S. freshwaters was $2.2 billion. This estimate included recreational and angling costs, property values, drinking water treatment costs, and a conservative estimate of the costs of the loss of biodiversity. Polasky and Ren (2010) cited research that estimated that if two lakes (Big Sandy and Leech) in Minnesota had an increase in water clarity of three feet, lakefront property owners would realize a benefit of between $50 and $100 million. Southwick Associates (2006) estimated that the present value of Saginaw Bay coastal marshes for active recreational use was $239 million, or approximately $10,000 per acre.

Additionally, the vast majority of the citizens of the United States and our society place a high priority on conservation of wetlands and maintenance of high standards of water quality, for many reasons that go well beyond their direct economic values. A nationwide survey (Responsive Management 2001) documented that there were 15 times the number of citizens who believed there were too few wetlands compared to the number that thought there were too many. The same survey showed that 91% of the public thought that it was "very" (64%) or "somewhat" (27%) important to protect or conserve wetlands. Only 3% were neutral or considered it unimportant.

Furthermore, survey after survey has documented that the American public has a deep concern about water quality and high expectations for water conservation. For example: water pollution was identified as the most important environmental issue facing Florida (Responsive Management 1998a); 65% of Idaho residents thought more time and money should be spent on protecting Idaho's water resources (Responsive Management 1994); 89% of Indiana residents thought that improving water quality was very important (Responsive Management 1998b); 75% of West Virginia residents thought much more effort should be spent on restoring streams that have been damaged by acid rain or acid mine drainage (Responsive Management 1998c). Kaplowitz and Kerr (2003) noted that 75% of Michigan residents viewed the flood control services provided by wetlands as very or extremely important, and 87% viewed the wildlife habitat functions provided by wetlands similarly. A recent survey of Minnesota residents found that 83% of the electorate is concerned about the pollution of drinking water (Fairbank, Maslin, Maulin, Metz and Assoc. and Public Opinion Strategies 2010). Duda et al. (2010) describes how survey after survey of sportsmen and of the general public shows significant concern regarding safe, abundant, high quality water resources.

Many additional studies could be cited that demonstrate the value of wetlands and other water resources to federal, state and local economies, and to the great majority of U.S. citizens. Although we understand that this issue is not directly relevant to the technical aspects of the draft guidance, we nevertheless believe that the available literature regarding the economic benefits of protecting the Nation's wetlands and other resources, and regarding the sentiment of the general public in support of clean and abundant water, provides valuable context for the overall direction that the final rule should take. Taken together, the overall message of the relevant economic and societal information supports the view, frequently shown to be shared by the vast majority of the public, that the conservation of wetlands and water resources is not and should not be viewed as a choice *between* economic and environmental benefits, but rather that long-term, shared economic benefits are *dependent upon* water resource protection.

VI. Balancing Science and Pragmatism in Fulfilling the Purposes of the Act

In our previous discussion of the fundamental criteria for a final rule, we encouraged the agencies to craft a rule that is scientifically and administratively efficient and pragmatic in fulfilling the purposes of the Act. An underlying assumption, of course, is that in seeking to apply the significant nexus test, there is an obligation to ensure that the scientific processes used produce valid results with which to make sound decisions. Unfortunately, these two objectives can be somewhat in opposition to one another. Good, valid science requires time and money, not only to gather the relevant facts but to do so over a spatial scale and time period sufficient to adequately account for the inherent temporal and spatial variability that exists within aquatic systems. However, an administratively efficient system seeks certainty and predictability, as well as timeliness, in the decision-making process. A final rule must balance these issues, but must do so in a way that is most likely to fulfill the purposes of the Act and be consistent with the weight of the scientific evidence.

The growing post-*Rapanos* case law is making it increasingly clear that a dependence upon case-by-case analyses of significant nexus is creating a growing expectation and burden to collect as complete a record of the science-based facts as possible (Kerns 2014). These analyses can be very costly and time-consuming, but as complete and sound as they might seek to be in documenting the facts within a short (at least one annual cycle) time frame, from a scientific standpoint their validity is nevertheless compromised by not assessing the inter-annual variation that can lead to significantly different results and determinations. Thus, the extent to which a regulatory path emphasizes the use of case-by-case analyses, it will be more impractical and costly for all entities, and perhaps open the door to increased litigation to dispute science-based facts drawn and interpreted from various perspectives (e.g., short-term vs. long-term, small versus large spatial scale, variable interpretations of scientific and legal "significance"). In addition, there is inherently less clarity, certainty, and predictability associated with a broader emphasis on case-by-case analyses.

Also, as is seen in and exhaustive review of the literature such as the Connectivity Report, wetlands and other aquatic features exist along a continuum of multiple variables. Disputes between regulators over "facts," and even the variability with respect to perspectives on significant nexus among the perspectives of regulators, create additional uncertainty for all concerned, as well. The complexity of case-by-case analyses could be overwhelming in many respects and lead to "paralysis by analysis," or alternatively, to making decisions through a process that is neither scientifically valid nor as accurate as possible or necessary in a given situation.

Therefore, a reductionist approach to applying case-by-case analyses within the rule will not lead to a rule that accomplishes the agencies' stated objectives, such as maximizing clarity, while at the same time fulfilling the purposes of the Act to the maximum extent supported by the weight of the available and emerging science. These overall circumstances should lead the agencies to seek the more "simple truths," i.e., the generalizations that are valid in light of the overall weight of the scientific evidence, and that are as broadly applicable as possible. The science should be viewed broadly, focusing on scientifically valid commonalities and reasonable generalizations, and should not give undue weight to the exceptions and outliers. In light of the massive amount of science that demonstrates significant nexus of many classes of "other waters" within their regional contexts, designation as jurisdictional by rule will most often be more scientifically accurate than a designation as non-jurisdictional until determined to be so via a case-specific significant nexus assessment that would suffer from the inherent shortcomings addressed above.

In considering the scope and direction of the reasonable generalizations that can be made regarding the significant nexus between many "other waters" and navigable waters, the agencies should also consider the trends in the recent, emerging science and what the application of new technologies tells us about the inter-relationships of these classes of waters. Consideration of these issues has important ramifications for appropriate and scientifically justifiable application of jurisdiction in fulfillment of the Act's purposes.

For example, even the incremental advances in the remote sensing analysis that took place between each update of the national wetland status and trends by the U.S. Fish and Wildlife Service has led to the detection of more wetland acres than had been observed in the previous analysis. These changes simply reflected improvements in the accuracy and precision of the technology. Frohn et al. (2009) used remote sensing to identify and map geographically isolated wetlands, and offer a number of recommendations to achieve high accuracy. However, their work highlights weaknesses associated with many existing datasets, indicating that underestimation of wetland acreage on the landscape and their level of connectivity is more the norm than not. Their recommendations also provide additional emphasis on the concerns regarding the time, cost, and considerations of scientific validity that are involved in conducting case-by-case significant nexus analyses. Based on an analysis of a Georgia landscape in which geographically isolated wetlands are common, Martin et al. (2012) demonstrated that improvements in techniques and technology can lead to improved accuracy and showed an increased detection of wetlands. However, it seems evident that application of these technologies at large spatial scales would be extremely costly, particularly at a time when the National Wetlands Inventory is being phased out due to fiscal constraints and federal agency budgets, in general, are under great pressure.

Further, the increasing use of LiDAR technology (e.g., Lane and D'Amico 2010; Lang et al. 2013) is dramatically affecting the detection of wetlands on the landscape and analyses of their connectivity. Lang et al. (2012) looked at Delmarva bays among the forested wetlands in the Choptank River watershed in Maryland and Delaware, and found that LiDAR was considerably more accurate than was the NHD high resolution data which underestimated wetland area by 15% and wetland number by 13%. This kind of difference could have an important and meaningful impact upon the outcome of any significant nexus analyses of watersheds such as this.

Overall, the trends in the wetland science being generated as a result of emerging technology, as well as the trends in the rapidly growing science related to the connectivity between wetlands and navigable waters, supports the general view that the emerging science far more often supports connectivity (in the aggregate) between "other waters" and downstream waters than it demonstrates a lack of connectivity. Regardless of the generalizations that the agencies use in the course of finalizing the rule and its determination of the classes of wetlands that will be jurisdictional by rule and those that will be subject to case-by-case significant nexus analyses, in light of the rate and importance of the emerging science relevant to science-based determinations of significant nexus, the final rule must incorporate a process whereby jurisdiction and related processes can be updated based on new science and data related to the actual observation of downstream impacts of wetland degradation and loss.

Summary

We summarize our primary conclusions and recommendations below, and provide the page numbers for other, related findings and recommendations, and a more complete articulation of the rationale and technical information in support of our comments.

- The touchstone for the final "Waters of the U.S." rule and future administration of jurisdiction must be the primary purpose of the Clean Water Act – *"to restore and maintain* *the chemical, physical, and biological integrity of the Nation's waters."* Justice Kennedy's language in creating the "significant nexus test" in his pivotal opinion in the *Rapanos* case, his description of its key elements, and the state of the existing and emerging science, provides a firm foundation for moving toward that goal. (Page 4)

- Ducks Unlimited's review and comments on the proposed rule were developed with five primary criteria in mind, and we suggest that explicit consideration and balanced application of these five criteria would help guide the agencies toward an effective final rule. These key criteria are:
  - *Is it consistent with the preponderance of the available and emerging science?*
    - ➢ There is a wealth of scientific information indicating the extent to which connectivity exists between many wetlands across the U.S. and downstream waters. The final rule should not diverge from the science that broadly supports the existence and significance of these connections. In addition, we strongly recommend the use of a "weight of the evidence" approach to evaluating the massive amount of science available and applying it within the final rule. (Pages 5-7)
  - *Is it consistent with Justice Kennedy's language regarding the application of science to determining jurisdiction?*
    - ➢ Justice Kennedy's language not only seeks a limit to CWA jurisdiction, but it also provides significant deference to the agencies as long as their decisions and the final rule is based on the science of connectivity. The agencies should seek to reasonably apply that deference to protecting all waters necessary to achieve the purposes of the Act, based on the existing science, while addressing their limits to CWA jurisdiction. (Pages 7-8)
  - *Will it promote increased clarity, certainty, and predictability?*
    - ➢ We agree with the stated objective of the agencies, and the strongly expressed desire of most stakeholders, which is to have a final rule that provides as much clarity, certainty, and predictability as possible and that also addresses the other criteria listed here. (Pages 8-9)
  - *Is it scientifically and administratively efficient and pragmatic?*
    - ➢ While providing certainty and clarity and seeking to provide a science-based limit to jurisdiction, the final rule must also be pragmatic from both administrative and scientific perspectives. We suggest that this will be greatly aided by using a "weight of the evidence" approach to the science and processes incorporated within the final rule. (Pages 9-10)
  - *Is it consistent with the agencies' public statements that the new rule would not be an expansion of jurisdiction relative to the existing regulations, and that the agricultural and ranching sectors, in particular, would not be subject to increased permitting requirements?*
    - ➢ The language of the proposed rule has caused some concern, particularly among the farming and ranching communities, about how the final rule could affect their normal activities. The final rule must support the statements of agency representatives

that the longstanding exemptions for normal agricultural and ranching activities will be preserved, and that no new permitting requirements will be imposed upon farmers and ranchers in relation to such activities. (Pages 10-11)

- We agree that traditional navigable waters, interstate waters, and territorial seas should continue to be the foundation for assessing CWA jurisdiction. It is appropriate that the fundamental question of "significant nexus" for other categories of waters be viewed through the lens of assessing their impacts upon these (a)(1) through (a)(3) waters. We recommend that it be made clear that "international waters" are also included in this group of waters based on the same rationale as applied to interstate waters. (Pages11-12)
- Because traditional navigable waters, interstate waters, and the territorial seas ultimately provide the basis for designating by rule or assessing potential CWA jurisdiction for all other categories of waters, we strongly recommend that existing and readily available technology be used to map at least all (a)(1) through (a)(3) waters across the U.S. At the moment, it is extremely difficult if not impossible to find maps, even at the level of individual Corps districts, which clearly depict these waters. While there are limited maps available in some instances, and lists for some of these waters in some areas, there is by no means a cohesive, nationwide system of compiling and making this information available at this time. Although not an "emerging" technology, existing technology related to mapping and geographic databases could and should be used to develop this valuable, basic tool. (Pages 12-13)
- We agree with and support the relatively minor, clarifying changes made with respect to the issue of whether or not impoundments fall within the definition of "waters of the U.S." (Page 13)
- We agree that the literature "clearly demonstrates that streams, regardless of their size or how frequently they flow, strongly influence how downstream waters function." Therefore, the finding that all tributaries, as a class, have a significant nexus with and impact upon the physical, chemical and biological integrity of downstream (a)(1) through (a)(3) waters and therefore should be jurisdictional by rule, is scientifically appropriate and sound. However, we also agree with the Science Advisory Board's recommendation regarding reconsideration of the use of the "ordinary high water mark" as a part of the definition of "tributary." In addition, it should be made more clear that the treatment of ditches will not and cannot be used to expand the longstanding interpretation of jurisdiction as it applies to infrastructure used for normal agricultural activities. (Pages 13-14)
- We agree with the agencies' finding, based on the weight of the scientific evidence presented in the Report and the proposed rule's Appendix, that adjacent waters such as riparian and floodplain waters *"significantly affect the chemical, physical, and biological integrity of (a)(1) through (a)(3) waters"* due to the existence of a significant nexus. (Page 15)
- Based on the available science related to connectivity, however, we disagree with the almost exclusive emphasis placed on physical proximity to navigable waters within the definition of "adjacent." We strongly encourage that, in light of the abundant related science and the view of the SAB regarding the narrow view of adjacency applied within the proposed rule,

adjacency should be viewed from the more scientifically appropriate context of "functional adjacency." For example, while it might take years or even decades for water to travel through subsurface pathways from wetlands to navigable waters, the impact and importance of those connections are very often nevertheless significant and can affect not only the integrity of the receiving waters, but also the health and welfare of future generations of citizens. Thus, interpretation of "adjacency" must not be narrowly restricted based on physical proximity. (Pages 15-18)

- The science strongly indicates that riparian waters almost universally have a significant hydrologic connection and nexus with the jurisdictional waters that are usually adjacent, in the sense of both physical and functional proximity. Thus, the general goal of categorically incorporating riparian and floodplain waters as jurisdictional "adjacent waters" within the definition of "neighboring" is appropriate. However, the relationships between and definitions of "neighboring" and adjacent require additional clarification given some apparent inconsistencies among their definitions and conflicts with some important aspects of the science that supports the existence of a significant nexus in many cases. (Pages 18-19)
- We find the definition of "floodplains" scientifically reasonable but less clear than it should be. The heavy reliance on "best professional judgment" promotes uncertainty and decreases clarity and predictability, and could lead to significant administrative, non-scientific inconsistencies across the country. We suggest considering the use of more objective, science-based surrogate criteria such as soil classifications as the basis for defining "floodplain." We also believe that a 10 to 20 year flood zone is too narrow to reflect the actual floodplain in many circumstances, and that in light of the definition's use of the phrase *"is inundated during periods of moderate to high flows,"* we suggest that something more on the order of 100 years is a more reasonable approximation of "high flows." (Page 20)
- It must be clear in the final rule that agricultural areas such as rice fields will not be captured within the terms of these definitions as jurisdictional waters. In addition, some of the exclusions for waters such as irrigation reservoirs can also benefit from additional clarity of language. (Pages 20-21)
- However, we cannot agree with the proposed treatment of "other waters," and we believe that the underlying regulatory presumption that all "other waters," across the entire U.S., lack a significant nexus with traditionally navigable waters, interstate waters, or the territorial seas, and therefore have no impact on the integrity of these waters, is an inappropriate presumption in light of the strength, abundance, and diversity of the available and rapidly growing science. To make this presumption is to willfully exclude waters that science clearly demonstrates have a significant impact upon downstream waters and thus will result in degradation of the chemical, physical and biological integrity of the Nation's waters. (Pages 21-22)
- One of our most significant recommendations is that rather than require case-specific significant nexus analyses on the basis of single point of entry watersheds across the nation, we recommend that during the finalization of the rule the agencies should conduct

"significant nexus analyses" for these "other waters" on an ecoregional basis. Then, based on the available science and judgments of wetland and hydrologic experts for each ecoregion, it should be determined for which regions of the country the wetlands that exist therein should be designated as jurisdictional by rule. This process will help ensure that the final rule aligns most closely with the science and, in addition, will provide more clarity, certainty and predictability than the proposed rule. It will also be more scientifically and administratively efficient and pragmatic to apply. (Pages 21-24 and elsewhere)

- We recommend that when case-specific analyses of "other waters" are conducted, the required significant nexus should be able to be applied to any categorically designated "water of the U.S.", including not only (a)(1) through (a)(3) waters but also at least (a)(4) and (a)(5) waters. Waters that will be classed as "waters of the U.S." by virtue of their adjacency should likely also be included as a potential avenue of demonstrating significant nexus as those waters are clarified. (Page 22)
- The final rule should incorporate a process whereby, in addition to the ecoregional designations of wetland categories to be jurisdictional by rule, the results of future significant nexus analyses at all scales should be incorporated and used to build a science-based "case law." These findings should then be incorporated into the proposed database and otherwise made widely available for public and regulatory use. (Page 24)
- In regard to all significant nexus analyses, conducted either *a priori* or after finalization of the rule, we strongly agree with the SAB's statement in their letter that, "*The Board notes, however, that the science does not support <u>excluding</u> groups of "other waters" or subcategories thereof.*" If the science currently available is not considered in certain cases to be sufficient to support a finding of a significant nexus at this time, it does not mean that such a nexus does not exist. Future science could emerge that could clearly demonstrate such a nexus. The final rule must allow for the continual emergence of new science and the incorporation of that science into the process of assessing jurisdiction. (Page 24)
- With respect to the definition of "significant nexus," we recommend that the final rule go further in terms of explaining with more clarity how Justice Kennedy's language should be used in the science-based context of the analyses of connectivity that will be conducted for "other waters." This would also allow the agencies to more thoroughly explain how a "weight of the evidence" approach could or would be used in the context of significant nexus analyses. The definition and explanation in the final rule should not only convey the legal perspective on the term, but also provide additional guidance regarding the science-based analyses required to satisfy the legal question of "significant nexus." (Pages 24-25)
- Regarding the question of whether or not a nexus is "significant," the agencies should consider the range of pollutants (or fill) that could be deposited in a non-jurisdictional wetland and their potential impacts on the integrity of downstream waters, as well as health and human welfare, now and in the future. (Page 26)
- With respect to determinations of whether "other waters" are considered "similarly situated," we believe that a scientifically valid and more clear and efficient method of aggregating

wetlands would be to evaluate them all in a simple, direct, comprehensive aggregation within the appropriate ecoregion or other scale. Justice Kennedy's language seems to allow or support such an approach, and does not specifically require a finer technical interpretation of "similarly situated." (Page 26)

- At a minimum scale, we can agree with aggregating wetlands for significant nexus analyses on the basis of the single point of entry watershed to the nearest (a)(1) through (a)(3) watershed. However, we strongly believe that in many, if not most instances regarding watersheds at this scale, a review of its topographic, soils, land use, and the many physical, chemical and biological characteristics reflected in the watershed's wetlands and other water bodies will be very similar, and in some cases almost indistinguishable, from neighboring watersheds. Therefore, combining adjoining watersheds to the extent scientifically appropriate and justifiable would lead to greater administrative efficiencies, and perhaps actually strengthen the results and validity of the scientific evaluation of significant nexus by expanding the "sample size." (Pages 27-29)
- We strongly agree with the SAB that some subcategories of "other waters" could be determined to be jurisdictional by rule. It is clear that the breadth and depth of the available science warrants conducting significant nexus analyses for wetlands, in the aggregate, for a number of significant regions of the country to determine which regions contain wetlands that warrant designation as jurisdictional by rule with a positive finding of significant nexus. That would also advance the objective of increased clarity, certainty, and predictability, and promote greater efficiency through a reduced reliance on costly and time-consuming case-specific analyses. However, choosing to evaluate the regions for which the scientific evidence is strongest should not imply that "other waters" in other regions would have to "be determined to not be similarly situated." (Pages 29-30)
- The selection and use of the appropriate scale of regions for such analyses is a critically important part of the scientific rationale for taking the above approach to aggregation. We agree with the agencies' suggestion that Level III ecoregions represent an appropriate scale for such analyses. We agree with and strongly support the use of Alternative 1 (FR 22215), which is to *"determine by rule that 'other waters' are similarly situated in certain areas of the country."* (Pages 30-31)
- We concur with the proposed list of 25 regions as a starting point, although based on the available wetland science and context of "other waters" and navigable waters we also recommend the addition of several ecoregions. We strongly agree with the SAB's statement that*, "there is also adequate scientific evidence to support a determination that certain subcategories and types of 'other waters' in particular regions of the United States (e.g., Carolina and Delmarva Bays, Texas coastal prairie wetlands, prairie potholes, pocosins, western vernal pools) are similarly situated (i.e., they have a similar influence on the physical, biological, and chemical integrity of downstream waters and are similarly situated on the landscape) and thus are waters of the United States."* Thus, we suggest ecoregions 6,

7, 9, 34, 42, 46-48, 63, and 65 as the highest priorities for initial region-wide significant nexus evaluations of other waters contained therein. (Pages 31-33)

- We do not agree with the portion of alternative 2 (FR 22216) that would result in the "other waters" in those ecoregions considered to not have a demonstrated significant nexus to be designated as non-jurisdictional. We support the comment in the SAB's draft report in which they state that *"the Board notes, however, that the science does not support excluding groups of 'other waters' or subcategories thereof."* (Page 33)
- We strongly recommend that the agencies incorporate into the final rule a process by which "other waters" within ecoregions, or single point of entry watersheds, can be subject to scientific assessment, and/or re-assessment as necessitated by emerging science, and the findings incorporated into the cumulative body of scientific "case law." (Page 34)
- We agree with the inclusion of the list of waters that would be explicitly excluded from jurisdiction. Codification of the agricultural and other exclusions, direct and clear communications, and follow up CWA administration that is fully consistent with those communications, will be important for increasing certainty and predictability on the part of farmers, ranchers, landowners, and other affected parties. (Page 34)
- In section III of our comments we focus on highlighting and augmenting some of the existing science to support a finding that the "other waters," in the aggregate and across broad ecoregions or significant portions thereof, possess a significant nexus with downstream jurisdictional waters and therefore could be designated as jurisdictional by rule. (Page 35-37) Our detailed, science-based, technical contributions to an understanding of the basis for the existence of a significant nexus between "other waters," in the aggregate, and downstream jurisdictional waters are focused on the following regions and/or wetland subcategories:
    - Prairie potholes (Pages 37-50)
    - Texas and Southwest Louisiana Coastal Prairie Wetlands (Pages 50-54)
    - Nebraska's Sandhill Wetlands (Pages 54-55)
    - Playa Wetlands, Rainwater Basins, and Platte River Region Wetlands (Pages 55-58)

  However, this list merely reflects the landscape priorities of DU and should in no way imply that the "other waters" in some other ecoregions do not rise to a similar level of connectivity based on existing science. We are aware that other organizations are submitting detailed technical comments with similar focus on other regions, and we strongly encourage the agencies to consider all such science with a view to assessing and applying it as we suggest.
- Our technical contributions focus primarily on synthesizing the science that demonstrates that prairie potholes, in the aggregate, and some other wetland subcategories, have the required significant nexus to warrant being declared jurisdictional by rule. However, as is evident from the Connectivity Report and the SAB response, the scientific literature clearly documents that many other wetlands and wetland subcategories falling within the proposed rule's "other waters" classification have similar types of significant nexuses with downstream navigable waters. We therefore also highlighted some of the science bearing upon the existence, geographic extent, and general pervasiveness of the avenues of

significant nexus as they apply to wetlands broadly and based on science from other regional contexts. We organized and presented such contributions in the four categories of:
  - surface water storage and flood abatement (Pages 59-61)
  - groundwater recharge and base flow maintenance (Pages 61-63)
  - water quality relationships (Pages 63-67)
  - biological nexus (Pages 67-68)

- We provide an overview of some socioeconomic data and information relating to the importance of continuing to seek progress in achieving the goals and purposes of the Clean Water Act. Clean, abundant water resources not only supports the economically important outdoor recreation industry and desires of the sportsmen and sportswomen, but also avoids the economic burdens associated with the increasing frequency of damaging floods and harmful algal blooms, for example. Additionally, scientific surveys of the public from all across the country continue to show that very large majorities support wetland conservation and clean water goals. (Pages 68-71)
- A final rule must balance science and pragmatism, but in a way that is most likely to fulfill the purposes of the Act and be consistent with the weight of the scientific evidence. The extent to which the final rule relies upon case-by-case analyses will be more impractical and costly for all entities, and perhaps open the door to increased litigation to dispute facts drawn and interpreted from various perspectives (e.g., short-term vs. long-term, small versus large spatial scales, variable interpretations of scientific and legal "significance"). In light of the massive amount of science that demonstrates significant nexus for many classes of "other waters" within their regional contexts, designation as "jurisdictional by rule" will most often be more scientifically accurate than a designation as "non-jurisdictional until determined to be so" via a case-specific significant nexus assessment that would suffer from the inherent shortcomings imposed by scientific and administrative realities. (Pages 71-72)

We appreciate the opportunity to provide our comments on this important rulemaking. If you have any questions about Ducks Unlimited's comments, please do not hesitate to contact Dr. Scott Yaich at syaich@ducks.org, or 901-758-3874.

Sincerely,

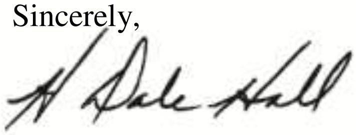

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Figure 1. Wetlands and waters in the Prairie Pothole Region. Note particularly high densities of wetlands in many areas. (Only wetlands and other waters are colored, with colors representing various classes of wetlands and other waters.)

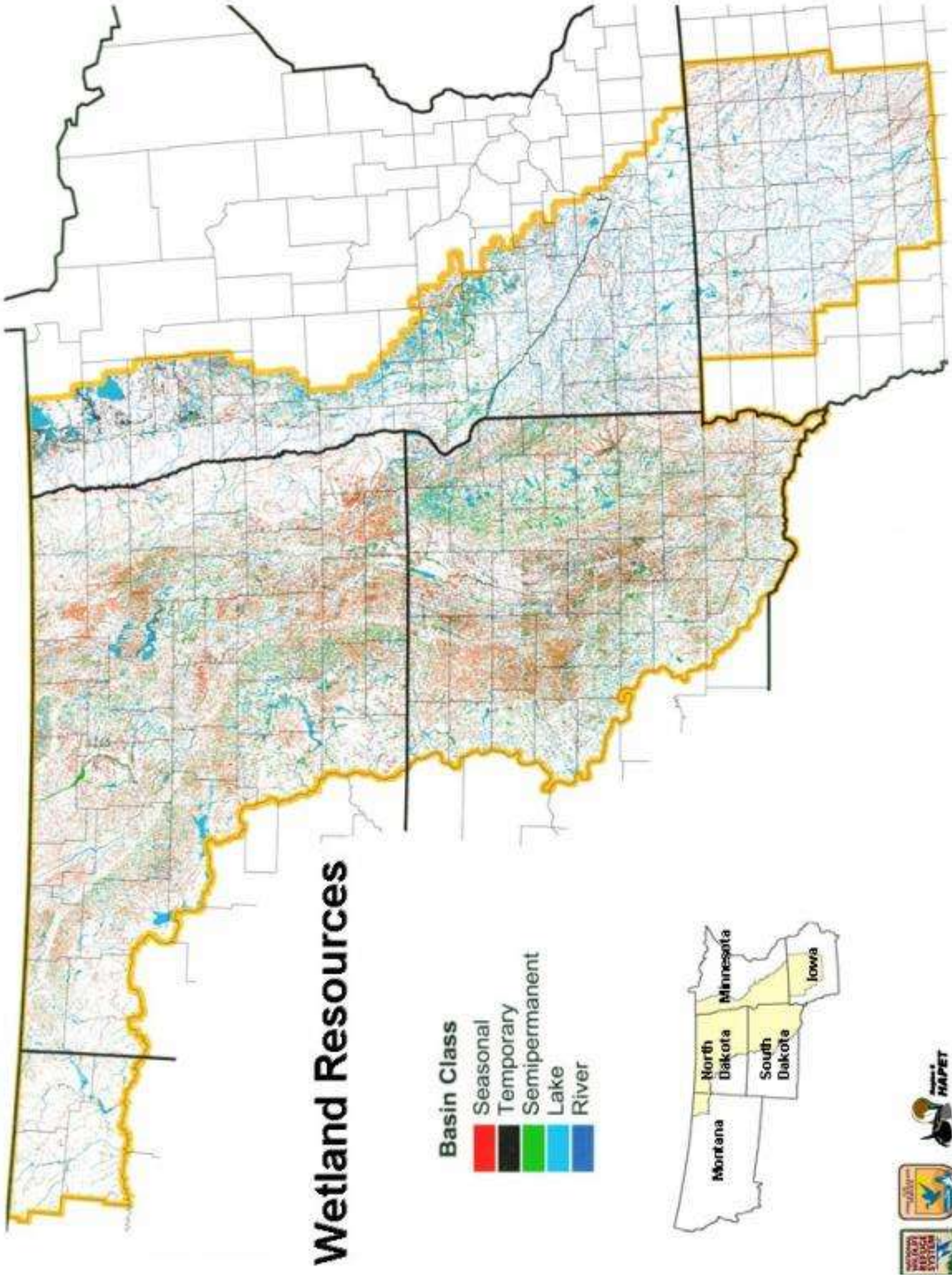


Figure 2. Aerial photograph of high density of prairie potholes ("other waters") in the Missouri River watershed, common in many areas of the Missouri Coteau of North Dakota, South Dakota, and Montana. The water storage capacity is evident in these and the following images.

Figure 3. Aerial photograph of an area with a high density of prairie potholes ("other waters") in Cavalier County, northeast North Dakota, in the Red River watershed (image approx. four miles by three miles) .

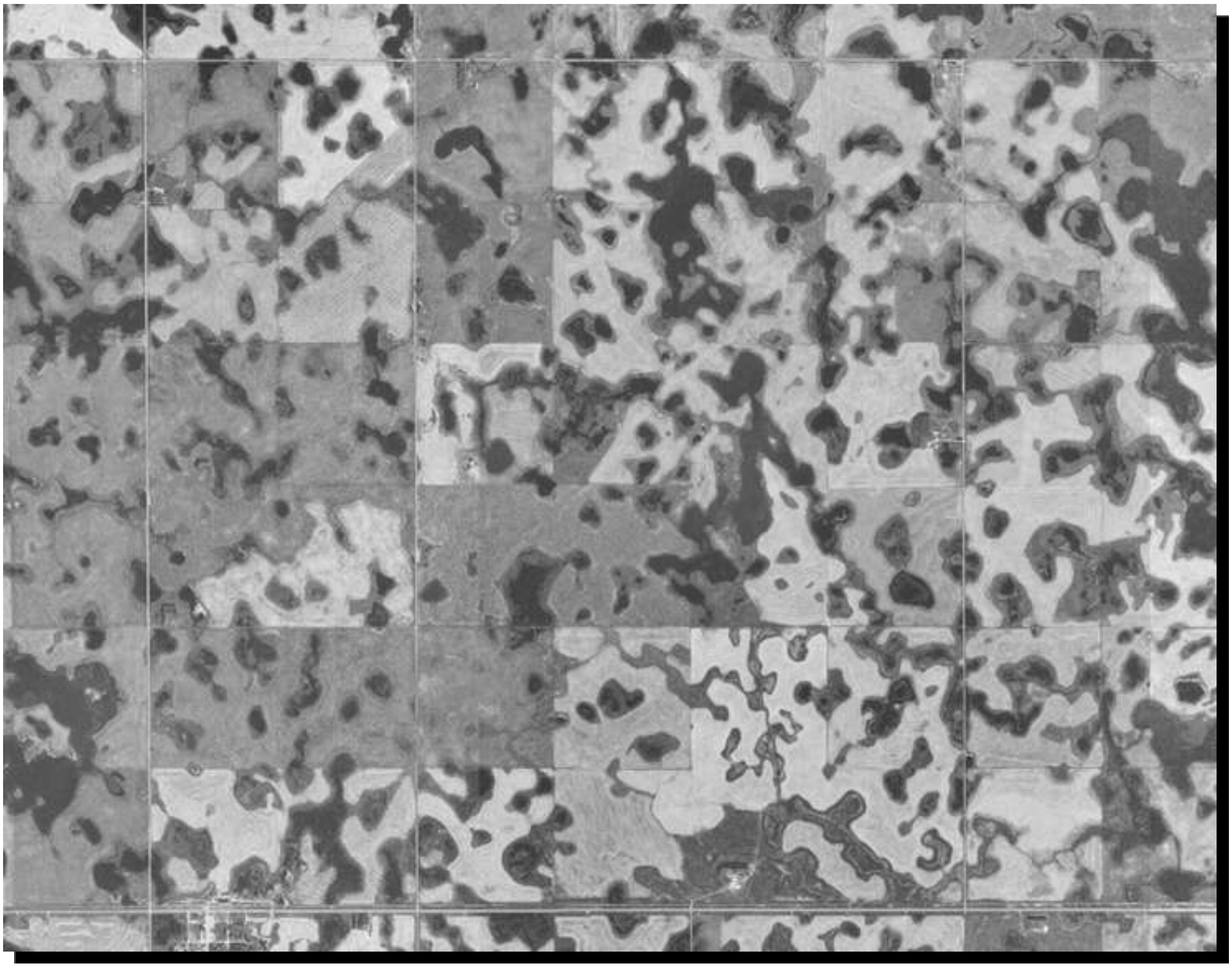


Figure 4. High density of prairie potholes in Souris River watershed, south (upstream) of Minot, North Dakota (Ward County).

Figure 5. High density of prairie potholes in the Missouri and James River watersheds of North Dakota (Stutsman County).

Figure 6. A high density of "other waters" in the vicinity of Lake Sakakawea, North Dakota (Missouri River), a traditional navigable water (McLean County).

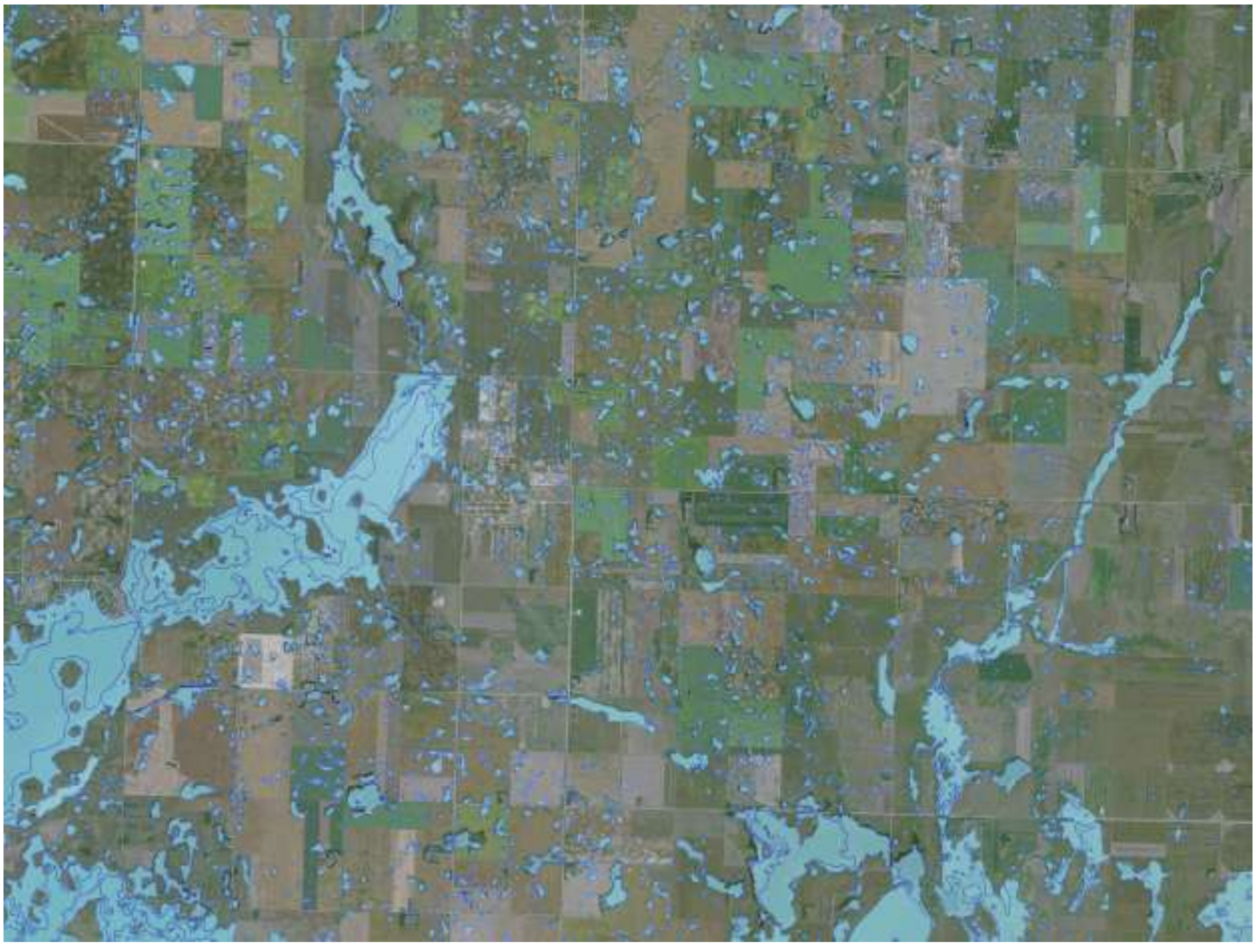
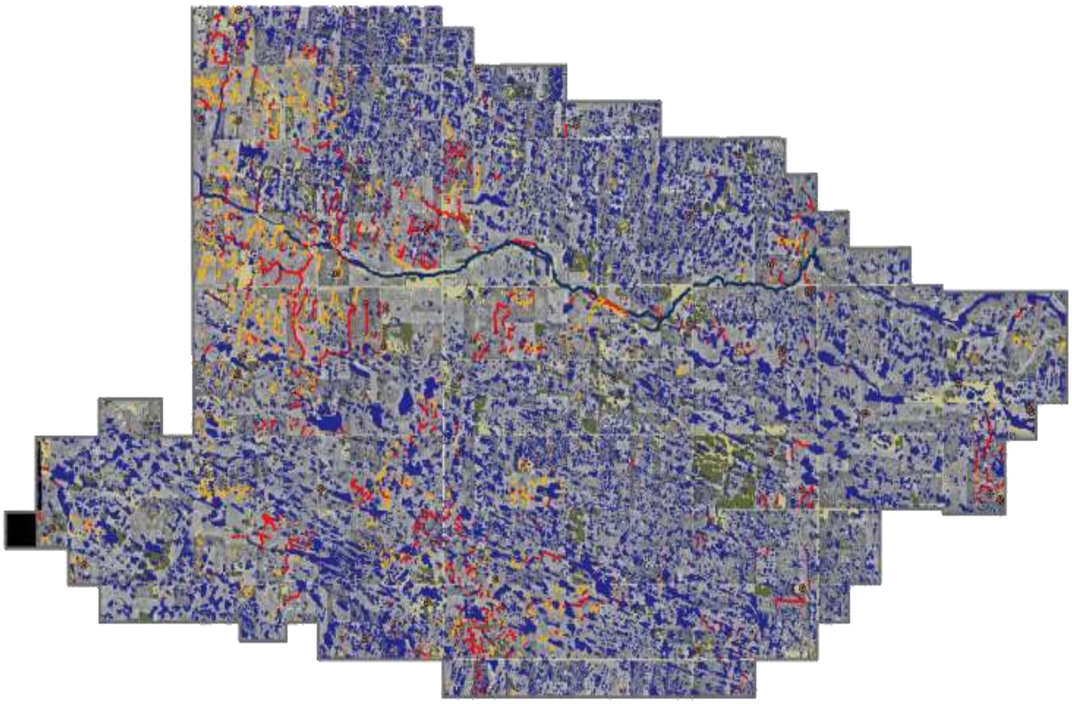


Figure 7. Wetland loss in vicinity of St. Gregor, Saskatchewan (Red River Valley), illustrating the extent of loss of water storage capacity across the landscape.



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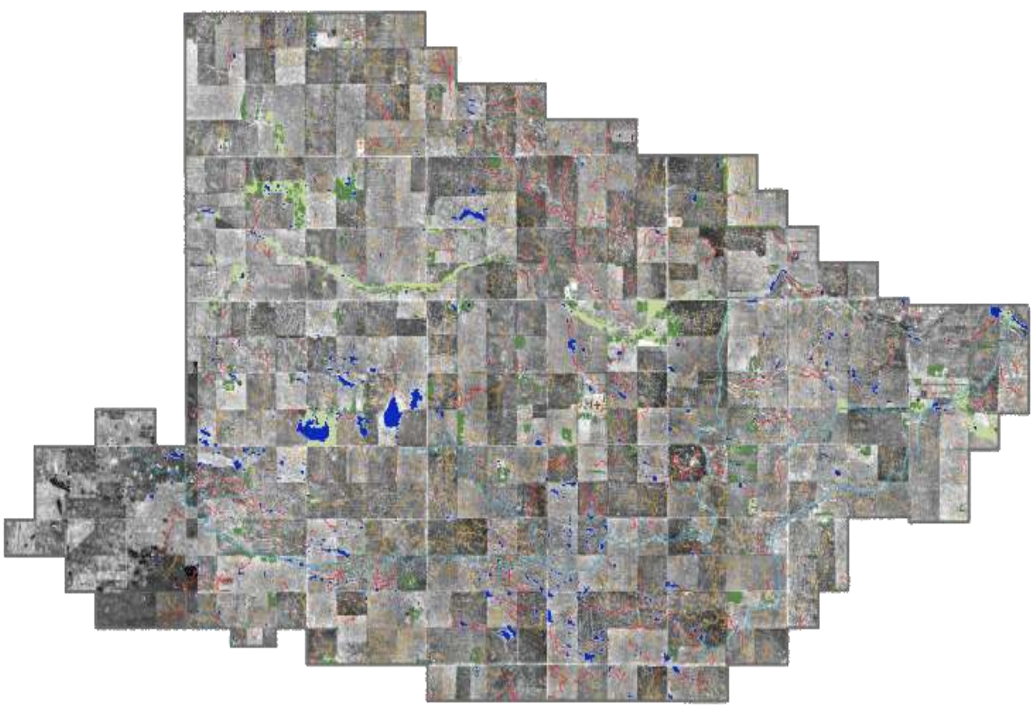

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Figure 8. Wetland status and drainage in the Smith Creek watershed, Saskatchewan, illustrating the increased level of connectivity and associated decrease in water storage capacity associated with loss of prairie pothole wetlands. The typically high density of pothole wetlands is also evident.

Figure 9. Aerial photographs (U.S. Fish and Wildlife Service) in the Red River Valley in the vicinity of Munich, ND that illustrate original wetland densities and the extent of loss between 1954 and 2010. The loss of water storage capacity results in water flowing more rapidly and directly to the downstream navigable waters rather than being stored in the wetlands.

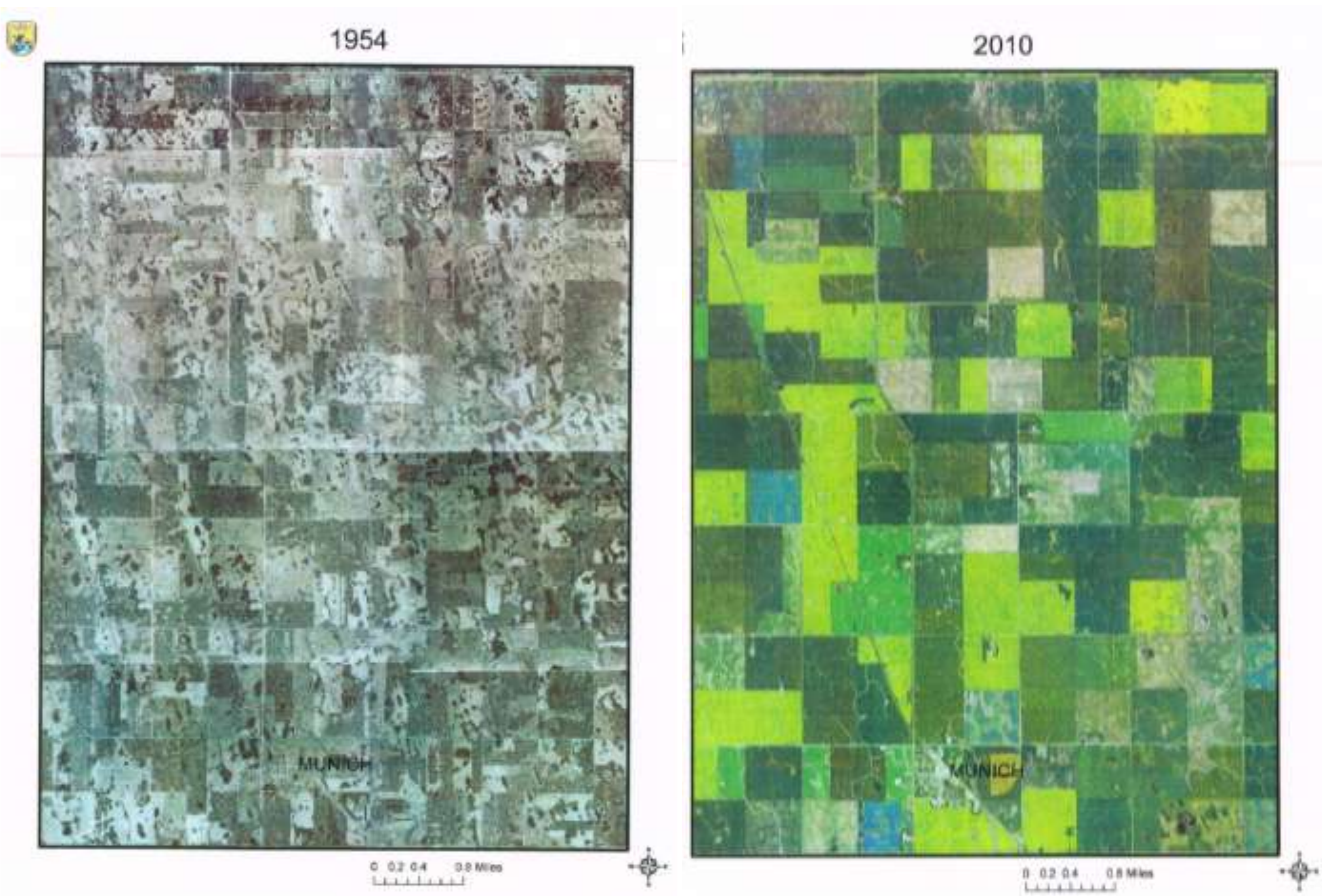
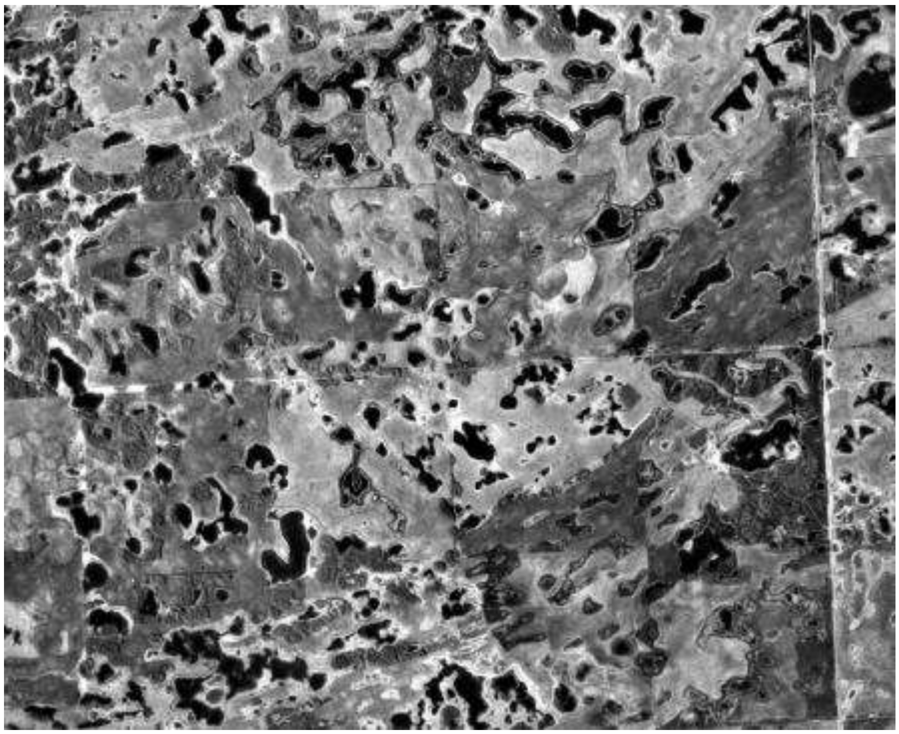


Figure 10. "Before" and "after" photos of wetlands and drainage in Smith Creek watershed, Saskatchwan, showing increased surface connectivity with downstream waters associated with wetland loss due to drainage and decreased water storage capacity (Pomeroy et al. 2014).



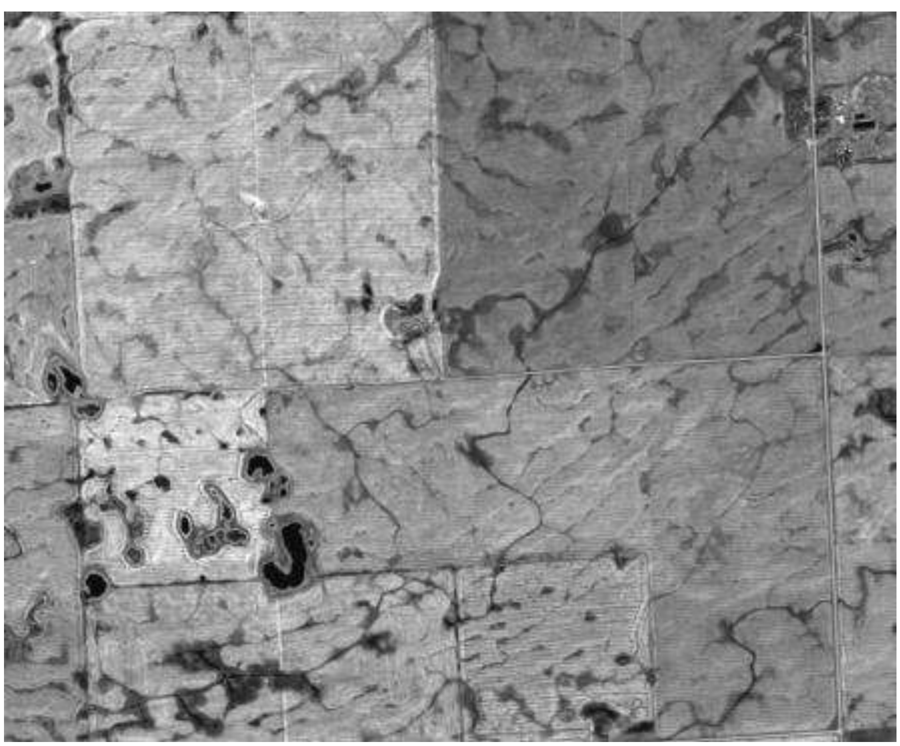


Figure 11. Oblique aerial photographs comparing a portion of the Prairie Pothole Region with intact wetlands with a recently drained portion of the region. The implications to the integrity of downstream navigable waters of draining these "other waters" is apparent.

Figure 12. Aerial photograh of playa wetlands. (Photograph taken from cover of Gurdak and Roe 2009)

Figure 13. Distribution and abundance of playas in relation to the High Plains (or Ogallala) aquifer. Approximately 92 percent of the more than 66,000 playas of the southern Great Plains and Playa Lakes Joint Venture (PLJV) region are located on the High Plains aquifer. Playas in southeastern Wyoming are not shown because these playas are not within the PLJV boundary. (Map from Gurdak and Roe 2009)