An Evaluation of the Revised Definition of "Waters of the United States," 84 Fed. Reg. 4,154 (proposed Feb. 14, 2019)

by Peter Howard, PhD, Institute for Policy Integrity at NYU School of Law and Jeffrey Shrader, PhD, School of International and Public Affairs (SIPA) at Columbia University

April 11, 2019

ABOUT THE AUTHORS

Dr. Peter Howard is the economics director at the Institute for Policy Integrity, where he specializes in climate change valuation and has recently published a meta-analysis of climate damages. He holds a Ph.D. in Agricultural and Resource Economics from the University of California, Davis, where his research focused on climate change, environmental policy, and agricultural policy. Howard also holds a B.A. from Bard College.

Dr. Jeffrey Shrader is an Assistant Professor at the School of International and Public Affairs (SIPA) at Columbia University. His research focuses on econometric identification and empirical analysis of questions in environmental and labor economics including the impacts of climate change, environmental effects on worker productivity, and business responses to environmental changes. He holds a Ph.D. in Economics from the University of California, San Diego, and a B.A., magna cum laude, from Columbia University. Shrader was an Economic Fellow at Policy Integrity from 2017-18.

ANALYSIS

I. Background

When the Environmental Protection Agency and Army Corps of Engineers issued the 2015 Clean Water Rule,[1] they provided an economic analysis showing the costs and benefits of the rule ("2015 Economic Analysis").[2] As part of that analysis, the agencies calculated the benefits of wetlands protection through a "unit benefits transfer approach," using values derived from a series of studies on the willingness to pay for a variety of ecosystem services provided by wetlands.[3]

Now, in the 2018 proposal to revise the definition of "waters of the united states,"[4] the agencies separate into two stages their analysis of the costs and benefits of withdrawing protections from wetlands. Stage 1 shows the agencies' calculation of forgone benefits and

[1] Army Corps of Engineers and EPA, Clean Water Rule: Definition of "Waters of the United States," 80 Fed. Reg. 37,054 (June 29, 2015).
[2] Army Corps of Engineers and EPA, *Economic Analysis of the EPA-Army Clean Water Rule* (2015) ("2015 Economic Analysis"), https://www.epa.gov/sites/production/files/2015-06/documents/508-final_clean_water_rule_economic_analysis_5-20-15.pdf.
[3] 2015 Economic Analysis 43-44.
[4] Army Corps of Engineers and EPA, Revised Definition of "Waters of the United States," 84 Fed. Reg. 4,154 (proposed Feb. 14, 2019) ("Proposed Replacement Rule").

cost savings of repealing the 2015 Clean Water Rule.[5] Stage 2 addresses the forgone benefits and cost savings of withdrawing even more protections from wetlands than were protected before the 2015 Clean Water Rule.[6] We address Stage 1 here.

In Stage 1, the agencies have reduced their estimate of the forgone benefits of repealing the Clean Water Rule relative to the original 2015 estimate of the Rule's benefits by excluding a set of valuation studies, which had originally been included in the agencies' 2015 analysis.[7] In the unit benefit transfer analysis of the 2015 Economic Analysis, the agencies used a set of ten contingent valuation ("CV") studies to calculate the benefits from protecting wetlands.[8] Now in the agencies' proposed revision, the agencies have included only four of those studies in a new unit benefits transfer analysis (the agencies added a single additional study, Newell and Swallow (2013), to the analysis).[9] In addition, the agencies calculated the wetlands values only for states that were either studied in those studies or were adjacent to those states. In this way, the agencies excluded the value of wetlands benefits in thirty states in the new unit benefits transfer analysis.[10]

The agencies also employed a new meta-analysis to calculate an alternative estimate for the national forgone benefits of Stage 1.[11] That meta-analysis is based on a 2018 working paper by Klaus Moeltner co-authors. The agencies' meta-analysis also leaves out the studies that were excluded from the alternative benefit transfer analysis.[12]

In both the agencies' new unit benefits transfer analysis and their meta-analysis benefits transfer analysis, the agencies have also refused to place a value on regional wetland benefits; instead, the agencies' new approach assumes that households within a given state only value the wetlands within that state's borders.

As we explain here, there are multiple problems with each piece of this analysis.

II. Study Exclusion in the Unit Benefits Transfer Analysis

As guidance from the Office of Management and Budget explains, "there is no mechanical formula that can be used to determine whether a particular study is of sufficient quality to justify use in regulatory analysis."[13] Instead, evidence should be weighed on its merits and the agencies should use all studies that include potentially valuable information to inform

---

[5] EPA and Corps, Economic Analysis for the Proposed Revised Definition of "Waters of the United States" at 1 (2018) ("2018 Economic Analysis"), https://www.epa.gov/wotus-rule/proposed-revised-definition-wotus-supporting-documents.

[6] *Id.*

[7] 2018 Economic Analysis at 60-61.

[8] 2015 Economic Analysis at 45.

[9] 2018 Economic Analysis at 60-61, 68.

[10] *See id.* at 70.

[11] *Id.* at 70-71.

[12] *See id.* at 60-61, 71. The agencies exclude Poor (1999) in the benefit transfer analysis and include it in the meta-analysis. But the agencies explain that they intend to "refine" the meta-analysis and ultimately exclude Poor (1999) from the meta-analysis. *See id.* at 71.

[13] OMB, Circular No. A-4 at 23 (2003). Circular A-4 was originally issued under President George W. Bush and the current administration has instructed agencies to follow it. Office of Mgmt. & Budget, Memorandum: Implementing Executive Order 13,771, Titled "Reducing Regulation and Controlling Regulatory Costs" (Apr. 5, 2017).

the calculation of the costs and benefits of regulation.[14] It may be appropriate to conclude that different studies have different evidentiary weight and some studies may have features that make them less useful than other studies. But as explained by the editors-in-chief of five leading scientific journals, "[i]t does not strengthen policies based on scientific evidence to limit the scientific evidence that can inform them."[15] Rather than exclude studies, the agencies should place different weight on each study in proportion to that study's evidentiary value.[16] Indeed, the agencies took this approach in the 2015 Economic Analysis. In that analysis, the agencies weighted studies by their sample size, one measure of a study's evidentiary value.

Here instead of following those principles, the agencies have excluded six studies from the benefits transfer analysis to calculate the forgone benefits of Stage 1.[17] That decision contravenes best practices and lacks justification. We discuss each excluded study in turn.

a. Poor (1999)

The agencies exclude Poor (1999) because the study's results fail to find a significant scope effect and the study values unique wetlands.[18] But neither concern is a sufficient reason to exclude the study. Scope effect refers to the idea that if a group values a good or service, then the group will place a higher value on larger quantities of that good or service.[19] The agencies concede though, that for CV studies "[e]xternal scope is a high bar and rigorous test of validity that some otherwise well-designed studies do not achieve."[20] While best practice recommendations are to test for scope effects, there are a number of reasons, independent of design, which may result in the failure to find a significant scope effect,[21] including the declining marginal utility of the studied good, preconceptions about whether the government can actually deliver on the good, and non-monotonic views about the good.[22] All of these factors could be present here and though they may limit the ability to find a significant scope effect, they do not undermine the value of the study.

In addition, the fact that the study looked at unique wetlands is not a reason to exclude the study. The agencies could weight the study to take that issue into account instead. For example, in the meta-analysis, discussed further below, the agencies control for several variables related to the uniqueness of the wetlands.[23] Moreover, the wetlands studied by Poor—isolated wetlands without a continuous surface connection to other bodies of water—are exactly the type of wetlands at issue with this rule, so the willingness to pay for protection of these wetlands is relevant to this rule.

Moreover, Poor's study contains useful data and is of high quality overall. As Moeltner and his co-authors found, Poor (1999) contains the information necessary for "deriving

---

[14] *See* Savage (1972); Executive Order 12291, 46 Fed. Reg. 13193 (Feb. 17, 1981).
[15] Berg, et al. (2018).
[16] For example, a study that has been successfully replicated could be assigned a higher evidentiary value.
[17] *See* 2018 Economic Analysis at 60-61.
[18] *Id.* at 61.
[19] Carson (2012), at 34.
[20] 2018 Economic Analysis at 61.
[21] Carson (2012), at 35.
[22] *Id*.
[23] *See* 2018 Economic Analysis at 73

willingness to pay estimates corresponding to a specific change in wetland acres."[24] In addition, the study adheres to a number of best practices for CV studies making its exclusion particularly inappropriate. For example, the survey instrument uses dichotomous choice surveys,[25] which are a recommended best practice.[26] In addition, the study's payment method is an increase in household taxes rather than voluntary contribution to a wetland preservation fund.[27] This method makes the study a high-quality study. As Richard Carson notes, contingent valuation studies that present respondents with some kind of coercive payment mechanism such as a tax are reliable because respondents are likely to believe that their responses have real personal consequences.[28] In addition, the study reports its results within a 95% confidence interval,[29] which is a best practice.

The choice of mean willingness to pay in the presentation of the survey results was not an "ad hoc" decision, as the 2018 Economic Analysis suggests, but instead was guided by inferences from the data and these values were reported with a 95% confidence interval.[30] In sum, the Poor (1999) study was a well-done study and it should not have been excluded from the agencies' updated benefits transfer analysis.

b. Azevedo et al. (2000)

The agencies exclude the Azevedo et al. (2000) study because that study does not present summary statistics or confidence intervals.[31] But the absence of that information does not necessarily reflect on the quality or reliability of the survey. In fact, it does not appear that the agencies used either factor in their analysis. If the agencies need the information, they should reach out to the authors to obtain it.

Moreover, several other factors point to the study's reliability. For example, the study, which was funded in part by a grant from the EPA,[32] used a dichotomous choice survey instrument to elicit willingness to pay for one of two wetland preservation projects.[33] As noted above, use of a dichotomous choice survey instrument is considered a best practice for conducting CV studies.[34]

The agencies also assert that it is "unclear" whether the study was peer reviewed, but that is not a sufficient reason to exclude the study.[35] EPA's Guidelines for Preparing Economic Analyses make clear that peer review is not a prerequisite to using a study.[36] And meta-analysis guidelines recommend that all research that meets the study selection criteria be

[24] Moeltner (2018), at 5.
[25] Poor (1999), at 254.
[26] Boardman, et al. (2018), at 451.
[27] Poor (1999), at 253, 254.
[28] Carson (2012), at 30-31.
[29] Poor (1999), at 259-61.
[30] *Id.* at 253, 259-61.
[31] 2018 Economic Analysis at 60.
[32] Azevedo (2000), at 17.
[33] *Id.* at 9-10.
[34] Boardman, et al. (2018), at 451.
[35] 2018 Economic Analysis at 60.
[36] United States Environmental Protection Agency ("EPA"), *Guidelines for Preparing Economic Analyses* at 7-52 (2010), https://www.epa.gov/sites/production/files/2017-08/documents/ee-0568-50.pdf.

included in the analysis, regardless of whether the research has been published.[37] Moreover, it can be useful to include studies that are not peer-reviewed. Published studies often have larger effect sizes than unpublished studies, and relying on them exclusively is not recommended as it can lead to the risk of "publication bias."[38] To avoid this problem, it can be very helpful to include non-peer-reviewed studies in an analysis. Indeed, 25% of the studies included in the agencies' meta-analysis are also not peer-reviewed.[39] And the Moeltner et al. study that the agencies rely on for the architecture of their meta-analysis is a working paper that has yet to be peer reviewed.[40]

Instead of excluding this study, the agencies should have weighted it appropriately to take into account the concerns that the agencies have flagged.

c. Dillman et al. (1993)

The agencies exclude the Dillman et al. (1993) study because it was not peer reviewed and uses a donation payment vehicle to value South Carolina wetlands.[41] But as explained above, the lack of peer-review does not mean that the study should be excluded. And while the payment methods used in the Dillman study are not considered as accurate as payment methods that lead survey participants to believe they could actually be forced to pay for the good at issue (e.g., though a tax),[42] that is also not a reason to exclude the study. In fact, one of the studies that the agencies rely on throughout the Stage 1 analysis, Whitehead & Blomquist (1991), also utilized a voluntary payment method.[43] The Dillman et al. (1993) and White & Blomquist (1991) studies are methodologically similar in other ways as well; they both use dichotomous choice surveys.[44] In light of the close methodological similarities between Dillman et al. (1993) and Whitehead & Blomquist (1991), excluding Dillman is arbitrary.

d. Johnson & Linder (1986)

The agencies excluded the Johnson and Linder (1986) study because the study's value estimations were derived solely from hunters.[45] But hunting is a common and important wetland use in many regions and thus it should not be ignored. For example, Whitehead & Blomquist (1991) found that of respondents who had actually been to the wetlands being valued in that study, over half had engaged in hunting;[46] in both Azevedo et al. (2000) and Poor (1999), hunting accounted for approximately 30% of respondents' wetland use.[47] The fact that the Johnson & Linder (1986) study focused on hunting is thus not a reason to exclude that study. Rather than exclude the study, the agencies should control for the

---

[37] Borenstein, et. al. (2011).
[38] Ackerman & Stanton (2010), at 8-9; Havranek, et al. (2015), at 405.
[39] 2018 Economic Analysis at 72, Table III-6.
[40] *Id.* at 70-72, 216.
[41] *Id.* at 60-61.
[42] Carson (2012), at 31.
[43] Whitehead & Blomquist (1991), at 2527.
[44] *Id.* at 2523, 2527.
[45] 2018 Economic Analysis at 61.
[46] Whitehead & Blomquist, at 2527.
[47] Azevedo (2000), at 14-15, Figure 3; Poor (1999), at 258, Table 2.

uniqueness of this factor. The agencies are familiar with this technique. They controlled for similar uniqueness factors in the meta-analysis[48] and used a weighting procedure in the 2015 Economic Analysis.

e. Lant & Tobin (1989)

The agencies exclude Lant & Tobin (1989) because of its small sample size.[49] But the solution to this problem is to weight the study by its sample size or standard error, not exclude the study. Indeed, that is what EPA recommends in its guidance[50] and what the agencies did in the 2015 Economic Analysis.[51] The agencies have not explained why they cannot employ similar weighting procedures in the 2018 Economic Analysis. Absent a satisfactory explanation, the exclusion of the Lant & Tobin (1989) study is arbitrary.

III. Meta-Analysis

In the 2018 Economic Analysis, the agencies conducted a meta-analysis to assess national forgone benefits.[52] The agencies use a meta-analysis formula from a 2018 working paper by Moeltner et al. (2018) and derive the inputs for this formula from studies identified in a literature review in that working paper.[53] But there are several problems with the Moeltner working paper and with the way that the agencies applied the Moeltner meta-analysis to calculate a national estimate of the forgone benefits (the benefit transfer analysis).

a. Study Exclusion

For an optimal meta-analysis, an agency should select studies based on their relevance to the question at hand, and then weight their estimates by their evidentiary value to calculate an average, estimated effect.[54] As a leading textbook on meta-analysis explains, improperly excluding studies can result in bias and to avoid such bias, all research that meets the study selection criteria should be included in the analysis.[55] The agencies appear to have excluded studies in a way that violates this principle.

The Moeltner working paper identified 24 wetland valuation studies as "candidate studies" for the meta-analysis and then excluded seven studies for failing to identify a "clear link" between acreage and willingness to pay.[56] But the Moeltner study does not divulge the names of the seven excluded studies. As a result, it is impossible to verify that the exclusions were appropriate, making the meta-analysis potentially unreliable.

That said, though the working paper does not name the excluded studies, the working paper and 2018 Economic Analysis do list the studies that were *included* and thus it is possible to conclude that the agencies either have excluded or plan to exclude the same list

---

[48] 2018 Economic Analysis at 73.
[49] *Id.* at 61.
[50] *See* EPA, *Report of the EPA Working Group on VSL Meta-Analyses*, Report EE-0494 (2006), https://www.epa.gov/sites/production/files/2018-02/documents/ee-0494-01.pdf.
[51] *Id.* at 72, 74, Appendix B.
[52] *Id.* at 70-71.
[53] *Id.* at 70-71.
[54] Hedges, & Olkin (1985), Chapter 14.
[55] Borenstein (2009).
[56] Moeltner (2018), at 4-5.

of studies from the meta-analysis that they excluded from the unit benefit transfer analysis. Whether or not those excluded studies were in the list of "candidate studies" and then excluded is not clear. As the list shows, the working paper does not consider Azevedo et al. (2000), Dillman et al. (1993), Johnson & Linder (1986), Land & Tobin (1989) and Roberts & Leitch (1997), five of the studies that were excluded from the agencies' unit benefit transfer analysis, discussed above. The working paper and 2018 Economic Analysis do include Poor (1999), a study that the agencies excluded from the unit benefit transfer analysis. But the agencies explain that they intend to "refine" the meta-analysis and ultimately exclude Poor (1999) from the meta-analysis.[57]

Assuming that the six studies were on the list of "candidate studies," their exclusion from the working paper's and the agencies' meta-analysis was arbitrary. The working paper claims that the unnamed excluded studies did not provide a "clear link" between willingness to pay and wetland acreage. But as the agencies' summary of studies used in the 2015 Economic Analysis makes clear, the six studies do provide estimates of willingness to pay that are relative to wetland acreage.[58]

And assuming the agencies take the position that these studies should be excluded in the meta-analysis for the same reasons they are excluded in the unit benefit transfer analysis, those reasons are not valid, as explained above. In fact, many of the reasons adduced by the agencies just do not apply in the meta-analysis context. Instead, those issues are factors that can be adequately addressed in a meta-analysis, without excluding the studies. For example, Azevedo et al. (2000) and Dillman et al. (1993) were excluded from the unit benefit transfer analysis because they were not peer reviewed and because they used a voluntary payment method. But, the working paper meta-analysis can and does control for those factors.[59] Thus, even assuming those were valid reasons to exclude the studies (and they were not, as discussed above), they certainly provide no reason to exclude the studies from the meta-analysis.

b. Problems with the meta-analysis

1. Sample size

As the working paper's authors concede, the sample size for the paper's meta-analysis was "small"[60] and an "unobserved confounding effect" could be skewing the results. In addition, the working paper's authors explain that reducing their "modest" sample size further "poses considerable identification problems."[61] Yet the agencies propose to exclude an additional study—Poor (1999)—which would reduce the sample size even further and compound these problems.

There are several problems with the small sample size. Given the small sample size and the fact that the agencies have used a high number of control variables when running the regression, the risk of multicollinearity is already high. If multicollinearity is present, that

[57] *See* 2018 Economic Analysis at 71.
[58] *Id.* at 66, Table III-2.
[59] *Id.* at 72 (listing peer-review and payment mechanism as variables in the meta-regression).
[60] Moeltner (2018), at 17.
[61] *Id.* at 8 & n. 3.

means that more than one explanatory variable may be linearly related, leading to imprecise and unstable results.

There are several indications that the small sample size is already causing significant problems with the agencies' estimation:

- The agencies' regression demonstrates that multiple variables are statistically insignificant, when those are variables that should be important.[62] For example, the regression shows that regional differences are not significant.[63] But regional differences are well documented.[64]
- As the Moeltner working paper points out, the "provisional" variable is unexpectedly negative. The working paper concedes that this could be due to the small sample size. In addition, it is a strong sign of omitted variable bias.

To fix these problems, the agencies should increase the sample size. One easy way to increase the sample size would be to include the excluded studies, mentioned above, along with all other relevant studies.[65]

The agencies should also conduct a model fitting exercise as well as a sensitivity analysis to assess the severity of these problems.

If the agencies fail to increase the sample size, they will still need to address the evidence of multicollinearity and omitted variable bias. In addition, the agencies should address the fact that the majority of the variables are insignificant. With such a small sample size, the agencies must explain why it is still acceptable to control for so many variables.

2. Statistical significance

Through a number of adjustments, the agencies have reduced the 2015 valuation of state-level wetlands benefits from $96.5-$106.9 million to $59 million in the 2018 estimate.[66] But the analysis shows that the new lower number is not statistically different from the higher, previous estimate. The upper boundary of the 2018 estimate's 95 percent confidence interval is $121 million implying that the 2015 estimate is within this interval.[67] As a result, according to the agencies' own analysis, it is not possible to say that the 2015 and 2018 values for state-level benefits are statistically significantly different at conventional levels of significance, even allowing for all of the agencies' 2018 methodological adjustments.

3. Application of the meta-analysis (benefit transfer)

In the 2018 working paper, the authors control for several values, including use value and local value.[68] In the 2018 Economic Analysis, agencies then apply those meta-analysis

[62] 2018 Economic Analysis at 73.
[63] *Id.* at 73.
[64] 2015 Economic Analysis at 50.
[65] *See* Jason Schwartz & Jeffrey Shrader, *Muddying the Waters* at 5-8 (2017), https://policyintegrity.org/files/publications/Muddying_the_Waters.pdf (discussing studies that should be included).
[66] 2018 Economic Analysis at 75-76; *see also* 2015 Economic Analysis at 53.
[67] 2018 Economic Analysis at 78.
[68] *Id.* at 73.

results to states in a new benefit transfer analysis.[69] In that benefit transfer analysis, the agencies use actual data for average income, regions, and "proportion of forested acres" to calculate the impact of those factors.[70] As for the local, provisional, regulatory, and cultural variables (marked as "local, "prov," "reg," and "cult"), the agencies have not explained how they set the variables when applying the regression results to the states. They have not explained whether they set those values at zero, the mean of the values found in the studies, or something else.

How the agencies set the value for those variables is crucial to understanding the validity of the agencies' benefit transfer analysis and its absence renders the analysis almost meaningless. Moreover, depending on what the agencies did, there could be a significant risk of undervaluation.

If the agencies used zero to set the value for those variables, that would mean that they vastly undercounted wetland benefits. Wetlands valuation is made up of both use value and non-use value. Use value is significant as people use wetlands for swimming, hunting, boating, and protecting drinking water supplies, along with many other uses.[71] The local, provisional, regulatory, and cultural variables include several important use values. For example, local is the value that nearby residents put on living near the wetland and regulatory is the value of ecological services provided by wetlands to individuals that benefit from them. The agencies controlled for those values in the regression and setting those values at zero in the benefit transfer analysis would mean that the value has been removed. But removing that value from the calculation would be an egregious error because it would mean that the agencies are ignoring an important factor in wetlands valuation.

If the agencies used something like the mean or the median of the values found in the studies, that is also a mistake. The local, provisional, and regulatory variables are all significant variables,[72] thus indicating that they are heterogeneous factors. In fact, the regression demonstrates that the "local" variable is the most significant variable in magnitude and significance.

Given the importance of these variables, to do a proper benefit transfer analysis for the states, the agencies should use actual state data in their analysis, as they did with average income, regions, and forested acres. To calculate the local variable, they can use the relevant local GIS data, which is easily accessible to them. That data would allow them to calculate the number of people that live near wetlands and use the wetlands and then calculate the state-by-state values accordingly.

Moreover, as explained above, the agencies have such a small sample size and so many control variables, that there is a strong potential for multi-collinearity in the benefit transfer analysis. This is highlighted by the fact that several of the control variables are insignificant and by the unexpected sign for the coefficient corresponding to provisional

[69] *Id.* at 77-78.
[70] *See id.* at 74.
[71] *See, e.g.*, Whitehead & Blomquist (1991), at 1; Loomis (1991), at 412.
[72] *See* 2018 Economic Analysis at 73.

services.[73] Yet the agencies are using these variables to make predictions at the state level, which can compound these problems further. The agencies should test how sensitive the variables are to including new data, to dropping some data points, and to changing control variables. The agencies should also report simple correlations between variables to help assess which variables are mostly likely to be collinear.

4. Convexity

As the 2018 working paper found, people value protecting wetlands more as the wetlands becomes larger.[74] If the baseline wetlands acreage in a state is 40,000, the values will be higher in that state than if the baseline is 10,000 acres. The agencies recognized this in the 2018 Economic Analysis, but to address the issue, the agencies set the baseline acreage at a low number—10,000 acres—the median value for baseline acres found in the Moeltner working paper.[75]

The median value is likely not an appropriate choice. As the Moeltner working paper found, freshwater wetlands range in size between 0 and 220,000 per state, with a *mean of 40,000*, four times higher than the 10,000 median figure. To illustrate the problem with using the median value, if 10,000 is the appropriate baseline estimate for the fifty states, that would mean that the United States has approximately 500,000 acres of wetlands total. But in reality, there are 100 million acres in the coterminous states[76] and close to 175 million acres in Alaska alone.[77]

Given the fact that the value people attribute to wetlands goes up as the wetland gets bigger, the 10,000 figure thus likely leads to a vast undercounting of the value placed on a significant number of larger wetlands. At the very least, the agencies should conduct a sensitivity test with the maximum acreage in a state and the 40,000 mean of the study estimates.

IV. Regional Benefits of Wetlands

In the 2015 Economic Analysis, the agencies used a "blended approach" to combine both state and regional wetland valuations into a single national valuation.[78] Regions were drawn in accordance with wetland region determinations made by the USDA's Economic Research Service.[79] The result was that for a given area of wetlands in State X, out-of-state households in the same wetland region were assumed to ascribe some positive non-use value to those wetlands. The 2015 Clear Water Rule justified the approach by explaining that "[w]hile we would expect use values for a given household to be largely contained

[73] See Moeltner (2018), at 17.
[74] *See id.*, at 30.
[75] 2018 Economic Analysis at 73.
[76] U.S. Fish & Wildlife Service, Report to Congress, Status and Trends of Wetlands in the Conterminous United States 2004 to 2009, https://www.fws.gov/wetlands/documents/Status-and-Trends-of-Wetlands-in-the-Conterminous-United-States-2004-to-2009.pdf.
[77] Alaska Dep't of Fish and Game, Wetlands, https://www.adfg.alaska.gov/index.cfm?adfg=wetlands.main
[78] 2018 Economic Analysis at 67.
[79] *Id.* at 62.

within the state where it is located, there is no reasonable justification for presuming that non-use values would only apply to wetlands contained within state boundaries."[80]

The agencies' 2015 conclusion is supported by the literature. First, science clearly establishes that water quality and downstream benefits can be linked due to water connectivity without regard to a state's boundaries.[81] Illinois wetlands that are hydrologically connected to the Mississippi River can have an impact on residents of downstream states, such as Missouri, Arkansas, and Tennessee.

Second, even putting aside downstream connections, existence or non-use values are an important and significant source of value for wetlands and those can transcend state boundaries. Existence or non-use values are "the value of a wetland resource received from the knowledge of wetland preservation, even without on-site or off-site use of the wetland."[82] Many of the studies that the agencies rely on in their 2018 Economic Analysis explain that non-use value is an important part of wetland valuation and frame their results as reflecting non-use values.[83] As Moeltner explained in a 2009 meta-analysis about wetlands valuation, only a small share of people studied had actually used the wetlands and the "lion's share of estimated economic benefits" in the studies he looked at was "likely associated with non-use or existence values."[84]

The studies relied on by the agencies also use out-of-state values to inform their results, demonstrating that people value out-of-state wetlands. For example, Blomquist & Whitehead (1998) included certain out-of-state households in the study of Kentucky wetlands.[85] Two of the excluded studies, Roberts & Leitch and Lant & Tobin (1989), conducted their studies using households outside of a single state.[86] In addition, there are a number of saltwater wetlands studies that make clear that people are willing to pay for wetlands across regional distances.[87]

Yet despite the significance of this value, in the 2018 Economic Analysis, the agencies did not include any regional use or non-use benefits.[88] While acknowledging that "wetlands can provide services and benefits to downstream waters beyond a state's boundaries," the agencies claim that a regional approach is inappropriate because the "the majority" of CV studies they relied on estimated willingness to pay only for wetlands inside the state.[89] But the fact that the "majority" of the CV studies calculate values inside a state does not mean that it is "inappropriate" to use them to calculate regional benefits.[90] Those studies provide

---

[80] 2015 Economic Analysis at 50.
[81] *See* U.S. Environmental Protection Agency, Connectivity of Streams & Wetlands to Downstream Waters: A Review & Synthesis of the Scientific Evidence at ES-2 (2015), https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=296414
[82] Blomquist & Whitehead (1991), at 2523.
[83] *See, e.g.*, Blomquist & Whitehead (1991), at 2523, 2527 (characterizing their results as reflecting primarily non-use values); Poor (1999), at 263 (finding a positive correlation between use and willingness to pay).
[84] Moeltner & Woodward (2009), at 95.
[85] Blomquist & Whitehead (1998).
[86] Lant & Tobin (1989), at 343; Roberts & Leitch, (1997), at 1-2.
[87] *See* Moeltner (2018), at 5; 2018 Economic Analysis at 71.
[88] 2018 Economic Analysis at 71.
[89] *Id.* at 67.
[90] Economic Analysis at 67.

estimates of non-use values that span large distances and do not establish or even suggest that those non-use values cannot cross state borders. Instead, the technique of using in-state numbers to estimate out of state values is well-recognized. In fact, the Moeltner and Woodward (2009) paper applies the meta-regression model to nearby county residents, Nevada residents, and Nevada and Utah residents.[91] Moreover, the agencies have a way of estimating the non-use values, as illustrated by the meta-analysis regression, and that method could be used to calculate numbers that would be appropriate for estimating regional non-use values.

The agencies also claim that including any regional benefits is "inappropriate" because using the USDA's Economic Research Service's wetland region determinations would apply willingness to pay values to wetland changes that are "thousands of miles away."[92] Even if the non-use values decrease over a large distance, that does not mean non-use values decrease to zero just on the other side of a state's border. The agencies must come up with some reasonable way of estimating regional wetland benefits and, despite the fact that some regions are quite large, using the USDA's Economic Research Service's wetland region determinations, as the agencies did in 2015, was a reasonable approach. In contrast, assigning zero to the regional value is not reasonable.

Indeed, the agencies themselves have included values for wetlands that are very far away from the individual who is valuing the wetland. The agencies' have included in-state non-use values by including all households within a state in the willingness to pay calculation, regardless of proximity to a given wetlands area.[93] For example, a household in western Texas would be deemed willing to pay for wetlands in eastern Texas, and vice versa, even though the state runs over 700 miles east to west.[94] The agencies' willingness to credit non-use values across large distances within a single state but not non-use value outside of that state is inconsistent and irrational.

In sum, setting the regional value at zero as the agencies have done lacks justification.

CONCLUSION

The agencies have committed a number of serious methodological errors in the new unit benefit transfer analysis and in applying the new meta-analysis to conduct an alternative benefit transfer analysis. These errors fundamentally undermine the reliability of their new calculations of the costs and benefits of repealing the Clean Water Rule.

[91] Moeltner and Woodward (2009), at 15.
[92] 2018 Economic Analysis at 62.
[93] *Id.* at 78.
[94] Craig Hlavaty, Amazing Facts: How Big is Texas?, *Houston Chronicle* (Nov. 18, 2014).

REFERENCES

Ackerman & Stanton (2010)	Frank Ackerman & Elizabeth Stanton, *The social cost of carbon*, A Report for the Economics for Equity and Environment Network, Economics for Equity and Environment Network, Cambridge (2010), https://www.sei.org/publications/social-cost-carbon/
Azevedo (2000)	Azevedo, C.D., J.A. Herriges, and C Kling, "Iowa Wetlands: Perceptions and Values" CARD Staff Reports (2000), http://lib.dr.iastate.edu/card_staffreports/17
Berg, et al. (2018)	Berg, J., Campbell, P., Kiermer, V., Raikhel, N., & Sweet, D., Joint statement on EPA proposed rule and public availability of data, 360 *Science* 6388 (2018), http://science.sciencemag.org/content/360/6388/eaau0116
Blomquist & Whitehead (1998)	Glenn C. Blomquist & John C. Whitehead, *Resource Quality Information and Validity of Willingness to Pay in Contingent Valuation*, 20 Resource & Energy Economics 179 (1998), https://doi.org/10.1016/S0928-7655(97)00035-3
Boardman et al. (2018)	Boardman, Greenberg, Vining, & Weimer *Cost-Benefit Analysis: Concepts and Practice* (2018).
Borenstein (2009)	Michael Borenstein et al, *Introduction to Meta-Analysis* 280 (2009).
Borenstein et al. (2011)	Borenstein, M., Hedges, L.V., Higgins, J.P. & Rothstein, H.R., *Introduction to meta-analysis*, John Wiley & Sons (2011).
Carson (2012)	Richard T. Carson, *Contingent Valuation: A Practical Alternative When Prices Aren't Available*, 26 J. Econ. Persp., No. 4, 34 (2012), https://www.researchgate.net/publication/260099785_Contingent_Valuation_A_Practical_Alternative_When_Prices_Aren't_Available
Circular A-4	OMB, Circular No. A-4, https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf
Connectivity Report	U.S. Environmental Protection Agency, Connectivity of Streams & Wetlands to Downstream Waters: A Review & Synthesis of the Scientific Evidence (2015), https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=296414

REFERENCES (cont.)

EPA Guidelines	United States Environmental Protection Agency, *Guidelines for Preparing Economic Analyses*, (2010). https://www.epa.gov/sites/production/files/2017-08/documents/ee-0568-50.pdf
Executive Order 12,291	Executive Order 12,291, 46 Fed. Reg. 13,193 (1981), https://www.archives.gov/federal-register/codification/executive-order/12291.html
Havranek et al (2015)	Havranek T, Irsova Z, Janda K et al., *Selective reporting and the social cost of carbon*, Energy Econ 51:394–406 (2015), https://www.sciencedirect.com/science/article/pii/S0140988315002327
Hedges & Olkin (1985)	Hedges, Larry V. and Olkin, Ingram, *Statistical Methods for Meta-Analysis*, Chapter 14 (1985).
Lant & Tobin	Christopher L. Lant & Graham A. Tobin, *The Economic Valuation of Riparian Corridors in Cornbelt Floodplains: A Research Framework*, Prof. Geographer 41(3) (1989), https://doi.org/10.1111/j.0033-0124.1989.00337.x
Loomis (1991)	Loomis, J., M. Hanemann, B. Kannimen, & T. Wegge, Willingness to Pay to Protect Wetlands and Reduce Wildlife Contamination from Agricultural Drainage, The Economics and Management of Water and Drainage in Agriculture, Chapter 21, pp. 411-429 (1991).
Moeltner (2018)	Moeltner, K., E. Besedin, B. Holland, and J. Balukas, Waters of the United States: Upgrading Wetland Valuation via Benefits Transfer, Working Paper (2018), https://www.regulations.gov/document?D=EPA-HQ-OW-2018-0149-0031
Moeltner & Woodward (2009)	Moeltner, K. & R. Woodward, Meta-Functional Benefit Transfer for Wetland Valuation: Making Most of Small Samples, *Environmental and Resource Economics*, Volume 42, Issue 1, pp 89-108 (2009), https://link.springer.com/article/10.1007/s10640-008-9205-0
Poor (1999)	P. Joan Poor, *The Value of Additional Central Flyway Wetlands: The Case of Nebraska's Rainwater Basin Wetlands*, 24 J. Agricultural & Resource Econ., 253, 259-61 (1999).

REFERENCES (cont.)

Roberts & Leitch (1997)	Lisa A. Roberts & Jay A. Leitch, *Economic Valuation of Some Wetland Outputs of Mud Lake, Minnesota-South Dakota*, North Dakota State University Agricultural Economics Report No. 381 at 1-2 (1997).
Savage (1972)	Savage, L. J. 1954, *The Foundations of Statistics*, New York: John Wiley and Sons (1972, Dover) (2d ed.).
Schwartz & Shrader (2017)	Jason Schwartz & Jeffrey Shrader, *Muddying the Waters* (2017), https://policyintegrity.org/files/publications/Muddying_the_Waters.pdf
Whitehead & Blomquist (1991)	John C. Whitehead & Glenn. C. Blomquist, *Measuring Contingent Benefits of Wetlands: Effects of Information About Related Environmental Goods*, 27 Water Resources Res. 2523, 2527 (1991), https://libres.uncg.edu/ir/asu/f/Whitehead_John_1991_Measuring_Contingent.pdf