Ephemeral streams, such as this one in western South Dakota, have lost federal protection under the Navigable Waters Protection Rule.

POLICY FORUM

WATER

Distorting science, putting water at risk

A recent rule is inconsistent with science and will compromise the integrity of U.S. waters.

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The Navigable Waters Protection Rule (NWPR) (*1*), which was published in April by the U.S. Environmental Protection Agency (EPA) and the Department of the Army ("the Agencies"), has redefined "waters of the U.S." (WOTUS) to restrict federal protection of vulnerable waters (*2*). With its emphasis on "continuous surface connections" and "permanen[ce]," the NWPR removes or reduces protection for U.S. waters, including millions of miles of streams and acres of wetlands, many of which comprise headwaters that are critical for sustaining water quality and healthy watersheds (*3*) (see the figure). Although the Agencies claim to have "looked to scientific principles to inform" the NWPR, science has been largely ignored and oversimplified. These new exclusions are based on selective parsing of statutory language and earlier case law, rather than on previously established, science-based interpretations of the U.S. Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA) (*4*). The EPA's own Science Advisory Board (SAB) found sufficient evidence to conclude that "…the proposed Rule lacks a scientific justification, while potentially introducing new risks to human and environmental health" (*5*). Responding to this unprecedented distortion of science and rollback in water protections, which went into effect nationwide on 22 June, will require coordinated efforts among scientists, lawmakers, and resource managers.

Clearly articulated in the CWA is the intention "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (*4*). The CWA was explicit in protecting "navigable waters," which Congress defined broadly as WOTUS; however, the extent to which waters other than navigable rivers, lakes, and territorial seas [traditional navigable waters (TNWs)] are protected has repeatedly provoked legal skirmishing. Particularly contentious are determinations about which nontraditional waters, such as wetlands and small tributary streams, contribute to the integrity of TNWs.

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The NWPR functionally ends the debate by elevating state over federal regulatory authority. Without federal law as a protective regulatory floor, states can and often do choose to leave waterbodies unprotected, making waters vulnerable to unregulated pollution, dredging, filling, and other activities that may profoundly erode water quality (*3*).

The NWPR downplays science by redefining protected "waters" and explicitly states that "science cannot dictate where to draw the line between Federal and State waters." The NWPR relies overwhelmingly (and arguably arbitrarily) upon the 2006 Supreme Court opinion by Justice Scalia in *Rapanos* v. *United States, Carabell* v. *United States Army Corps of Engineers* that lacked majority support. A more scientifically nuanced position was articulated by Justice Kennedy on the same case; the four dissenting Justices agreed with Kennedy's rationales for protecting waters, but would have protected even more.

The realized impacts are likely to be worse than projected, as ephemeral streams and nonfloodplain wetlands are usually underestimated by remotely sensed data (*3*). The economic analysis filed with the NWPR was largely silent about impacts, simply acknowledging that "the [A]gencies are unable to quantify [the scope] of these changes with any reliable accuracy" owing to geospatial data issues and uncertainty about government responses (*6*). Yet, in spite of this uncertainty and the potential for harm, the Agencies proceeded with a restrictive and risky rule.

CONNECTIVITY AND QUALITY

Connectivity is a cornerstone in understanding how freshwater ecosystem functions are sustained. In 2015, the Obama administration promulgated the Clean Water Rule (CWR) that included all tributaries and most wetlands as WOTUS (*7*). The scientific rationale for the CWR was reviewed in the EPA Connectivity Report (*8*), which synthesized >1200 peer-reviewed scientific publications and input from 49 technical experts. After a public review process, the 25-member EPA SAB confirmed the scientific underpinnings of both the Connectivity Report and the CWR.

Since then, the body of supporting evidence has grown (*3, 9*), enhancing our understanding of how the integrity of freshwater ecosystems within a watershed relates to the biological, chemical, and hydrological connectivity among waterbodies, including wetlands and ephemeral streams. This understanding recognizes as critical to services derived from freshwater ecosystems gradients of connectivity (versus a binary property: connected, not connected) that operate as a function of frequency, magnitude, timing, and duration of biological, chemical, and physical connections among waterbodies (*10*). By disregarding or misinterpreting the science of waterbody connectivity, the NWPR draws scientifically unsupported boundaries to distinguish WOTUS, reaches conclusions contrary to current science, and asserts legal and scientific views substantially different from those of the Agencies under previous administrations of both political parties going back to the 1970s. The NWPR promotes regulations contrary to what science shows about effective water protection. Although agencies often have latitude to adjust regulatory choices when implementing longstanding statutes, they cannot do so arbitrarily and without reasoned justification and rationales in light of relevant law, facts, and science.

In contrast to the CWR's recognition of biological, chemical, and physical connectivity, the NWPR relies solely on direct hydrologic surface connectivity to determine wetland jurisdiction. Nonfloodplain wetlands and ephemeral streams are categorically excluded on the basis of lack of hydrological connectivity irrespective of their degree of biological or chemical connectivity. Also excluded are floodplain wetlands lacking a direct surface water connection to TNWs "in a typical year," and intermittent tributaries lacking relatively permanent surface flows.

Such exclusions are inconsistent with evidence demonstrating that these waters are functionally connected to and support the integrity of downstream waters. Removal of federal protection is likely to diminish numerous ecosystem services, such as safeguarding water quality and quantity, reducing or mitigating flood risk, conserving biodiversity, and maintaining recreationally and commercially valuable fisheries (*3*).

EPHEMERAL, ISOLATED

Just as tiny capillaries play critical roles in the human body, nonfloodplain wetlands (so-called "isolated") and ephemeral streams (that flow only after precipitation events) support an extensive suite of ecosystem services. Because nonfloodplain wetlands and ephemeral streams are connected to one another and downstream waters along a gradient of connectivity, they also provide substantial cumulative or aggregate ecosystem services (*10*).

Because these wetlands and streams will summarily lose federal protection, they will be vulnerable to outright destruction, fill, or unpermitted industrial pollution discharges that risk transporting pollutants throughout watersheds. Losses of nonfloodplain wetlands could include particularly vulnerable and often valuable waters (*2*), including some playa lakes, prairie potholes, Carolina and Delmarva Bays, pocosins, and vernal pools. A preliminary analysis predicts widespread losses of wetland functions, with particularly high impacts on wetlands in arid and semi-arid regions. For example, the CWR protected 72%, whereas the NWPR will only protect 28% of wetland acres, in New Mexico's Río Peñasco watershed (*11*).

The NWPR also categorically excludes subsurface hydrologic connectivity. To disregard groundwater connectivity is to disregard the scientific understanding of how natural waters function. The Agencies justify this exclusion by claiming that "A groundwater or subsurface connection could also be confusing and difficult to implement." Although implementation may be challenging in some cases, claimed implementation ease under the NWPR should not supersede an evidence-based determination of connectivity given the potential for economic and environmental harm.

A PATH FORWARD IN UNCERTAIN TIMES

The NWPR directly conflicts with a growing body of scientific evidence and with input and review by federal and nonfederal scientists. The rule narrows WOTUS in ways that are inconsistent with longstanding views about the CWA's mandate to safeguard access to clean water. The NWPR opens previously protected waters to filling, impairment, and industrial pollution, and will undermine decades of investments restoring water quality across the United States and lead to profound loss or impairment of ecosystems and the services they provide. For context, the economic value of ecosystem services provisioned by nonfloodplain wetlands alone has been estimated at $673 billion per year (*2*).

Congress has the power to strengthen the CWA by enacting new legislation to replace or repeal the NWPR. Future administrations can reassess and act to restore protections through new rulemaking, without the need for new legislation. Toward these ends, the scientific community has already spoken on the matter, proposing three frameworks for the development of renewed protections based on sound scientific merits (*2*).

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Meanwhile, litigation may present challenges to and perhaps enjoin implementation of the NWPR. The April 2020 *County of Maui v. Hawaii Wildlife Fund* may help. In that case, the U.S. Supreme Court rejected an argument that would have eliminated federal CWA protections. The Court instead called for a functional and context-sensitive analysis of the disputed activities and their effects to determine federal jurisdiction over intentional pollution discharges into groundwater that predictably flows into WOTUS. In that 6 to 3 decision, the Court laid out a clear scientific basis for closing a loophole in the CWA, affirming for the first time that pollutants that travel through groundwater and then emerge into surface waters are in fact covered by the CWA.

Redoubled research efforts also can help address knowledge gaps critical for effective water policy. Quantifying the potential "harm" to clean water that will be caused by the NWPR is critical for both litigation and future rulemaking. Thus, the scientific community will be challenged to further demonstrate the consequences of changes to physical, chemical, and biological connectivity on water quality—especially in the context of nonperennial streams and nonfloodplain wetlands.

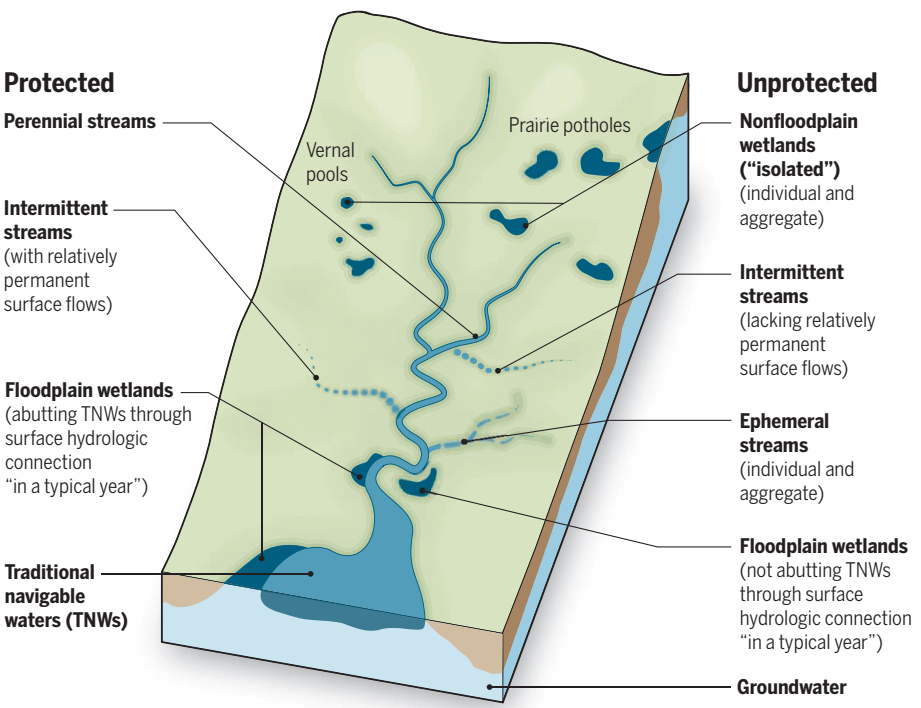
Research-based evidence on the impacts of climate change were notably absent in the NWPR and will also be critical in challenging the rule. Under current human-use and water-management schemes, many stream flows are declining, such that intermittent and perennial streams are increasingly being replaced with ephemeral streams that will lose protection. For example, the Upper Kansas River Basin lost 558 km (21%) of stream length between 1950 and 1980, presumably as a result of groundwater pumping exacerbated by climate change, with a cumulative loss of 844 km (32%) predicted by 2060 (*12*). Reduced mountain snowpack and increased evaporation have been implicated in the ~20% decline in the Colorado River's mean annual flow in comparison to the previous century; the Upper Colorado River basin supplies water to around 40 million people and supports ~16 million jobs (*13*).

Adoption of the NWPR is an indicator that the federal government is at least in part shedding the use of science and responsibility for water protection. Additional federal rollbacks of environmental protection, such as the Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act, a rule finalized on 15 July, could create a perfect storm for exploitation of water resources. Although federal statutes grant latitude to state, tribal, and local governments to provide additional, more protective regulation, many states do not do so, and many even prohibit regulations more stringent than federally required (*2*, *14*). Thus, absent federal protections, many waterbodies will go unprotected.

If the NWPR remains in place, local and grassroots approaches to water conservation, including watershed councils and coalitions, information and educational plans to reduce pollution, and university extension programs, will need to further mobilize to fill the vacuum created by the new rule. Such efforts would require additional resources and heightened stakeholder coordination. ■

Protected versus unprotected waters

Multiple waterbody types were initially under consideration for protection as "waters of the United States" under the Navigable Waters Protection Rule. Ephemeral streams flow only after precipitation events, intermittent streams flow periodically or seasonally, and perennial streams flow continuously. There are many types of nonfloodplain, or "isolated" wetlands, including prairie potholes and vernal pools, as illustrated here.



GRAPHIC: MELISSA THOMAS BAUM/*SCIENCE*

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