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Groundwater Challenges of the Lower Rio Grande: A Case Study of Legal Issues in Texas and New Mexico

Elizabeth Wheat

Department of Public and Environmental Affairs (Political Science),
University of Wisconsin-Green Bay, 2420 Nicolet Drive, MAC B327, Green Bay, WI 54311, USA;
E-Mail: wheate@uwgb.edu; Tel.: +1-920-465-2848

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Abstract: In 1938, Texas, New Mexico, and Colorado signed the Rio Grande Compact, establishing terms of apportionment for some of the water from the Rio Grande for the three states. Following congressional approval in 1939, this compact governs water allocation in a region with a variable climate and frequent drought conditions and established the Rio Grande Compact Commission, comprised of a commissioner from each state and one from the federal government, to enforce the compact. With an increasing population and declining surface water supply, the Compact has been tested among the parties and within the states themselves. In a case currently before the U.S. Supreme Court, *Texas v. New Mexico and Colorado* (2013), Texas claims New Mexico is violating the Compact and Rio Grande Project Act by using water in excess of its apportionment through its allowance of diversions of surface and groundwater. The issue is further compounded by disputes within Texas over separate legal regimes for groundwater and surface water. Combined with growing scarcity issues, the allocation of water in the Lower Rio Grande presents a timely natural resource challenge. This review explores legal issues involved in the case as well as growing challenges of population growth, agricultural development needs, and water shortages.

Keywords: groundwater; water; Rio Grande; Texas; Compact; Supreme Court; New Mexico

1. Introduction

The Rio Grande flows 1900 miles from the San Juan Mountains in Colorado before reaching the Gulf of Mexico [1]. It is the fifth longest river in the United States and forms a 1255-mile border with Mexico. Both countries share the Rio Grande/Bravo watershed of 335,000 square miles, necessitating international cooperation on the river's supply and health [2]. On the United States side, 75% of the water is allocated for agriculture, which means many of the disputes over water rights involve competing economic decisions [2]. This article will look at a current case before the U.S. Supreme Court between Texas, New Mexico, and Colorado over the Rio Grande Compact ("Compact") and each state's legal obligations for managing and sharing water of the Lower Rio Grande. To help the reader understand the context of the case before the Supreme Court I begin with a summary of the Compact and then discuss state water regimes in Texas and New Mexico. Colorado's state water laws are omitted because the Supreme Court case is primarily a dispute between Texas and New Mexico; Colorado is only listed because it is a party to the original Compact.

2. Discussion

2.1. Development of the Rio Grande Compact

Historically, groundwater availability in the Southwest became a point of contention as the region's population grew due to mining and agricultural development, placing a greater strain on available water resources. These land uses shaped the development of several water doctrines that varied by region or state, and created a complicated legal regime in which the federal government began working to address the water challenges and needs of the expanding country [3]. These legal regimes of riparian rights and prior appropriation will be discussed in greater depth in Section 2.3.

To address these water needs, President Roosevelt signed the National Reclamation Act in 1902 to use revenue from public land sales for large-scale irrigation projects that would store, divert, and maintain water in the arid states. This ushered in the Big Dam era of the 1930s, with peak construction from 1950 to 1980 [3,4]. Dam advocates promised these structures would generate rapid change, help with forest fire responses, and improve irrigation, navigation, and water storage. Opponents argued there were less expensive options for taxpayers and cautioned about the unknown environmental effects [5]. A "water bureaucracy" between the Army Corps of Engineers, Bureau of Reclamation, and Tennessee Valley Authority was tasked with facilitating these water projects with the states. As part of the dam construction, large reservoirs were also created and these become an integral point in the dispute between Texas and New Mexico.

While the United States is expanding dams during the Progressive Era, challenges with the country's neighbor to the South arose. In the late 1800s, the United States enacted an embargo on development of reservoirs on federal lands. The embargo was part of a dispute between the U.S. and Mexico, resulting in a 1906 treaty to lift the embargo, but it was only the beginning of disagreements between the two countries or between the states involved. The Harmon Doctrine states a country is sovereign over the international waters within its borders, but the U.S. has never followed it in practice and instead chose to consider Mexico's needs in managing this international watercourse on the United States side [6]. The U.S. government then reinstated the embargo and instructed Colorado, Texas, and New Mexico to

develop the Rio Grande Compact where each state would receive an adequate water supply along the Rio Grande. The agreement placed a limit on water use for each state using a credit and debit system [7,8].

Congress approved the Compact in 1939. It applies to use of waters of the Rio Grande above Fort Quitman, Texas, delivery of water from Colorado to New Mexico near the state line, and from New Mexico to Texas above the Elephant Butte Reservoir [9]. The Elephant Butte Reservoir's construction occurred between 1911 and 1916, with the fill beginning in 1915. It can store up to 2,056,010 acre-feet of water and supplies irrigation water supply for 178,000 acres of land and electric power for surrounding communities [10–12]. As of January 2015, the Elephant Butte Reservoir is approximately thirteen percent full, but the ongoing drought and increased temperatures in the Southwest will further complicate water available for irrigation and obligations for New Mexico under the Compact [13,14]. During a drought period, farms must pump from underground water sources to sustain their crops instead of water from the Elephant Butte or Percha Dams. New Mexico river flows are projected to decrease and scientists warn that if existing water use patterns do not change, the state will run a deficit for its required Compact contributions [15]. In many parts of Texas, heavy groundwater pumping for agriculture is rapidly depleting available groundwater resources. For example, the Ogallala Aquifer's pumping rate is six times greater than its recharge rate and this aquifer supplies a majority of the state's groundwater supplies [16]. The urgency of these water problems and forecasts of a worsening drought demonstrate the importance of resolving the current Compact dispute.

2.2. Requirements of the Compact

For the Colorado portion of the Compact, there are four index stations located at the Rio Grande headwaters and a schedule of water deliveries. A credit and debit system allows for water to be stored in the Elephant Butte and Caballo Reservoirs [9]. According to Craig Cotton, the Colorado Division Engineer from the Rio Grande Division, the Compact requires the state deliver water from the Rio Grande (approximately 27%–28% of average flow) and its main tributary, the Conejos River (approximately 38% of average flow) [7]. This is measured by hydrologic flow curves that account for conveyance losses. The challenging aspect for the state is it must project its water needs in advance of actual need. For low flow periods, Colorado's projections are prioritized, but in high flow periods the state's delivery obligations increase. One hundred percent of excess water must be sent to New Mexico and Texas during extremely high flow periods and farmers are prohibited by the state from diverting water that flows by their property [7].

New Mexico must deliver a set amount of water to the Elephant Butte Reservoir, approximately 105 miles north of the Texas state line. The Bureau of Reclamation then allocates water between the Elephant Butte Irrigation District (EBID) and El Paso County Water Improvement District (EPCWID) No. 1 [17]. EBID is an 8500-member irrigation district that delivers river water in the southern area of Sierra County and Doña Ana County [18]. It receives 57% of the reservoir water and the EPCWID receives 43%.

2.3. State Water Regime: Texas

Texas' legal system divides water into several classes—surface, groundwater, atmospheric—each of which is governed by separate legal systems. For surface water, Texas is a dual doctrine state, recognizing both riparian and prior appropriation legal regimes. A majority of the state's water law focuses on surface water, with very little on groundwater or atmospheric moisture [19]. It is important to note surface water rights are considered property rights in Texas [20]. Surface water is defined in the Texas Water Code (§11.021) as “water of the flow underflow and tides of every flowing river, natural stream, lake, bay, arm of the Gulf of Mexico, and stormwater, floodwater or rain water of every river, natural stream, canyon, ravine, depression, and watershed in the state” [20].

Riparian doctrine governs surface waters, giving rights to the water based on ownership of land adjacent to a natural river or stream [21]. An individual's water rights are directly connected to the land owned and may be freely exercised as long as the use is reasonable [21]. Riparian rights originated from Hispanic legal principles during Spanish settlements and continued with the Mexican government and through the Republic of Texas until 1840 when the state's Congress adopted English common law [19]. Under common law, courts develop rules for riparian owners based on cases over water conflicts. Realizing the problematic nature of riparian doctrine for arid areas where water and riparian land are both limited, the prior appropriation doctrine was adopted around 1900 and water rights must be acquired from the state through statutory processes.

Under prior appropriation (Texas Water Code §11.027), the first person receiving a permit has senior water rights to any subsequent permit holders. In contrast to the case-based nature of the riparian doctrine, prior appropriation is based on statutes and rights are acquired by complying with these statutes [21]. This “first in time, first in right” approach can be altered by the Texas Commission on Environmental Quality (TCEQ) if there is an imminent threat to public health or safety through an emergency permit, order, or amendment to an existing permit under Texas Water Code §11.139. Compensation must be made to the water right holder for water taken to address the emergency [20].

Since the appropriation doctrine was adopted, state water agencies faced administrative challenges recognizing and protecting these new rights while remnants of the riparian system remained law. Conflicting records and duplicate allocation of waters under both systems greatly complicated management of the state's surface water [19]. Following the failure of a judicial resolution for state water rights in the *State v. Hidalgo County Water Control and Improvement District No. 18* (1967) case, Texas passed the Water Rights Adjudication Act. This statute merged the riparian rights system into the prior appropriation system, creating an adjudication procedure administered by the Texas Water Commission, now known as the Texas Natural Resource Conservation Commission [19]. This adjudication process has been upheld as constitutional and a comparatively more efficient system of permits and allocation of water rights exists because there is now a unified water system instead of two competing regimes [21].

For groundwater, Texas law divides it into two classes: percolating groundwater and water flowing in well-defined underground streams [19]. All groundwater is presumed to be percolating unless otherwise proven and is governed by the rule of capture, granting landowners rights to capture water beneath their property [21]. Based on the Texas Supreme Court case *Houston & T.C. Ry. V. East* (1904) upholding English common judge-made law, a landowner can pump and use the water on his/her land with few restrictions, regardless of the impact on adjacent landowners [19,22]. Groundwater provides

60% of the 16.1 million acre-feet of water used in the state of Texas with 80% of the groundwater used for crop irrigation [16,23]. Comparable usage statistics for the entire Lower Rio Grande are difficult to obtain with the United States Geological Survey's most recent data published in 1985. At that point in time, 77% (900,000 acre-feet) of the groundwater drawn from the Rio Grande aquifer was used for agricultural purposes and 15% (180,000 acre-feet) was used for public supply primarily in Albuquerque, Las Cruces, and Sante Fe [24]. Statistics from the Bureau of Reclamation project a shortfall of 592,084 acre-feet of water per year in addition to 86,438 acre-feet needed due to climate change, for a projected total demand of 678,522 acre-feet in the year 2060 [25].

In 1949, Texas passed a law to create local groundwater conservation districts (GCDs) for underground water and to exert controls over groundwater uses by landowners. Texas manages much of its groundwater through these Groundwater Conservation Districts (GCDs) created by the legislature under Article XVI §59 of the Texas Constitution or by the TCEQ, which has primary jurisdiction of state groundwater regulations [26,27]. Each GCD is mandated to have a groundwater management plan (GMP), regulate spacing and well production, and monitor conditions of the district's aquifers. The Texas Water Development Board must approve the groundwater management plans of these districts and as of December 2014, there are 96 confirmed districts and all management plans for these districts have received approval [28]. GCDs are authorized to regulate the amount of water withdrawn from the aquifers with little process for appeal [29]. According to the Texas Administrative Code §356.52, a GMP must specify the district's ground water goals which include the following: "The most efficient use of groundwater, controlling and preventing waste of groundwater, controlling and preventing subsidence, addressing conjunctive surface water management issues, addressing natural resource issues, addressing drought conditions, addressing conservation, groundwater recharge, and desired future aquifer conditions" [27]. There are also Groundwater Management Areas (GMAs), required as of 2005, to develop desired future conditions (DFCs) for aquifers crossing political boundaries. Six regional aquifer alliances exist in Texas and the Texas Water Development Board (TWDB) acts as the overseeing state actor [30]. The TWDB's responsibilities include conducting groundwater studies, monitoring water levels and quality, reviewing the GMPs, and conducting investigations to help policymakers and legislators [16]. Local governments may also receive grants from the TWDB for water supply projects. Most central to the legal water rights issues discussed in this paper, the TWDB administers the Texas Water Bank to facilitate the transfer, sale, and lease of water rights in the state [31].

The proposed development and sale of groundwater by private companies looking to expand their businesses and revenue illustrates one challenge Texas faces with groundwater allocation and managing increasing water shortages. The Val Verde Water Company proposes pumping 16 billion gallons a year for sale to cities in need of water such as San Antonio or San Angelo. The San Antonio Water System (SAWS) solicited private sector company proposals for developing new water supplies in the area, but announced in February 2014 that the three pumping projects in the final round of consideration would be tabled and SAWS would instead pursue desalination plans for brackish water [32]. SAWS President Richard Puente said, "Groundwater law in Texas leaves too much uncertainty and risk for the private and public sectors. I hope that the proposers and cities across the state will join SAWS in calling for the Legislature to change the law so Texans can build projects to meet growing future demand" [32]. Opponents are concerned increased groundwater pumping proposals such as Val Verde's, would jeopardize water from Devils Lake which feeds into Lake Amistad on the Texas-Mexico border and the

Lower Rio Grande. The importance of this proposal is to show the growing demand and need for water and willingness of private companies to step in and provide services for the government. If Texas chooses to contract for these kinds of plans, it will become critical for the GCDs and TCEQ to closely monitor the pumping and greater environmental risks of brackish groundwater pumping [33].

For the third and final class of Texas water regimes, the state's courts have taken the unique approach of finding water rights for atmospheric moisture since interest in weather modification grew post-World War II. While it is not the only state recognizing such rights, Texas affords more rights than any other state in the country [19]. In *Southwest Weather Research, Inc. v. Duncan* (1958), the court said, "We believe that the landowner is entitled...to such rainfall as may come from clouds over his own property that nature in her caprice may provide" [19]. Following the Weather Modification Act of 1967, the Texas Water Development Board gained control of weather modification and the Texas Water Commission issues licenses and permits for modification operations [19]. This class of rights will not factor into the Supreme Court dispute, but it is important to briefly discuss and provide the reader with a full picture of water classes in the state.

2.4. State Water Regime: New Mexico

New Mexico's water law can be divided into state law, interstate law (such as the Compact), federal law, and Native American historic use water rights. The state is party to several water allocation arrangements, including settlement agreements with First Nations through the New Mexico Office of the State Engineer, but the Compact will be the primary focus since it is at the center of the Supreme Court dispute [22]. New Mexico Statutes Annotated (NMSA) §72-1-1 (1907) recognizes surface-water rights, later extended by the legislature in 1941 to include underground waters defined as "underground streams, channels, artesian basins, lakes, and reservoirs having 'reasonably ascertainable boundaries'" [34]. Article XVI, §3 of the state Constitution describes the state's doctrine of prior appropriation and defines beneficial use for New Mexico. Implementation of this doctrine in New Mexico resembles the Texas surface water approach prior to their unified water system, with the first user (senior appropriator) having the right to take and use the water over a junior appropriator in times of drought [34].

In contrast to Texas treating surface and groundwater separately, New Mexico administers its water regime through a conjunctive water management approach established by the decision in *City of Albuquerque v. Reynolds* (1962) [35,36]. Conjunctive water use looks at the hydrologic connection between surface water and groundwater, and develops a system of timing by shifting when and where water is stored based on availability. Conjunctive water management uses this water use approach, but adds monitoring, evaluation of the monitoring data, and works to develop local management plans [37]. New Mexico's Supreme Court has upheld this management approach and recognizes the State Engineer as having jurisdiction over the Lower Rio Grande Basin [38]. The New Mexico Environmental Improvement Board (NMEIB) and the New Mexico Water Quality Control Commission (NMWQCC) hold the responsibility for adopting regulations and setting groundwater standards, with the NMWQCC is the official water pollution control agency in the state [34]. There is ongoing litigation in New Mexico over surface and groundwater rights in the state such as the Aquifer Science LLC or Augustin Plains Ranch cases, but for the purposes of this article, the Supreme Court case is the primary focus [39,40].

2.5. Case before the Supreme Court

The TCEQ argues New Mexico's groundwater pumping is reducing the flow of the Rio Grande and therefore violates terms of the Compact [41]. Texas claims New Mexico's issuance of permits for 2500 wells between the Elephant Butte Reservoir and state line are reducing the amount of water Texas receives [17,12]. The state does not dispute that New Mexico is delivering the required amount of water to the reservoir, but alleges the Compact's purpose or intent is violated by water diversion prior to delivery to Texas [42]. The suit states, "The Rio Grande Compact is predicated on the understanding that delivery of water at the New Mexico-Texas state line would not be subject to additional depletions beyond those that were occurring at the time the Rio Grande Compact was executed" [13]. In *Texas v. New Mexico and Colorado* (2013), Texas is asking the Court to stop New Mexico's diversions, compensate the state for water it has removed through the diversions, and specify the amount of water Texas is entitled under the Compact [17,42]. The state has allocated \$5 million for litigation in this case based on the FY 2014 budget [13].

New Mexico's response to the depletion claims is that the Compact does not mandate a specific amount of water to be delivered to Texas-New Mexico state line and only requires a certain amount be delivered into the reservoir. Additionally, New Mexico contends the area between the reservoir and Texas state line falls under New Mexico law. Governor Susana Martinez stated New Mexico "will not cede one inch of New Mexico water to Texas" [17] Attorney General Gary King said he felt Texas is "trying to rustle New Mexico's water and is using a lawsuit to extort an agreement that would only benefit Texas while destroying water resources for hundreds of thousands of New Mexicans" [13].

EBID, at the center of the dispute, is under New Mexico law for groundwater, but is combined with Texas under the Compact for river water regulation. In 2008, EBID signed an Operating Agreement with the federal government and its Texas counterpart, EPCWID, in El Paso to share water and avoid a legal battle between the states [1]. The agreement allowed water to be carried over from one year to the next. EBID believes this agreement has been successful, potentially distancing the district from the state's Compact dispute with Texas [43]. When it comes to the Supreme Court dispute, EBID Manager Gary Esslinger said, "We'll not necessarily be taking New Mexico's side or taking Texas' side" [18]. Esslinger notes the 2008 agreement guarantees farmers in Texas receive their share of river water and the success of the agreement positions EBID well before the Supreme Court in the current case. The New Mexico State Engineer then sued Texas to overturn this Operating Agreement in *New Mexico v. United States, EBID, EPWCID#1* (2011), but the lawsuit was stayed by Justice Browning, pending the Supreme Court case that is the focus of this research [12].

Texas v. New Mexico and Colorado (2013) proceeded directly to the United States Supreme Court because the Court has original jurisdiction in disputes between two or more states under Article 3 §2 of the Constitution [44]. For this type of case, a state is required to file a motion seeking permission to file the complaint and submit a brief explaining why the Supreme Court should hear the dispute [42]. Original jurisdiction cases can proceed directly to the Supreme Court without going through the lower federal courts and the justices do not have to provide an explanation as to why they accept or deny a given case. Texas filed the required motion for this case in January 2013 [45]. The Court will consider three factors in making the decision whether to hear the case: if the case is really between states (and not state agencies), seriousness of the dispute, and whether there is an alternative forum to hear the dispute [42].

The case centers on Texas and New Mexico and their pumping next to the Rio Grande, but as a party to the Compact, Colorado is implicated [7]. A complicating factor to the Compact and case is that Texas does not treat surface and groundwater as part of the same water system, meaning it does not use a conjunctive water management approach, though both its 1969 and revised 1984 water plans specify conjunctive water management as a desirable goal [28]. Texas landowners have the right to capture which gives them the ability to use the groundwater on their land [30]. The Compact, Texas, and Colorado all have separate legal regimes for surface water and groundwater, with Texas placing very few restrictions on water use and New Mexico as the only state operating a conjunctive water management system. When trying to reach a judicial resolution for Compact disputes, this wide variation of legal doctrines makes it difficult [7].

In January 2014, the Supreme Court issued an order explaining that it may have jurisdiction in the dispute between Texas and New Mexico, but also suggested New Mexico file a motion to dismiss the action. Gary King, Attorney General for the State of New Mexico described this order in saying, “Clearly, I was hoping for a different outcome, however, I am not surprised. I am confident that the Court takes such state to state disputes very seriously and we look forward to being able to tell New Mexico’s side of the story and to have our day in Court” [15].

On 9 July 2014 the Supreme Court distributed this case for the 29 September 2014 conference. This indicates the court is considering the petition to hear the case, but not yet decided whether it will hear oral arguments and issue a ruling. On 3 November 2014, the court appointed a Special Master to do the following: fix the time and conditions for the filing of additional pleadings, to direct subsequent proceedings, to summon witnesses, to issue subpoenas, and to take such evidence as may be introduced and such as he may deem it necessary to call for [46]. As of the time this article was submitted for publication, a 29 January 2015 deadline has been set for all parties to file motions. Thus far, the following parties have filed amicus briefs: Hudspeth County Conservation and Reclamation District No. 1, El Paso County Water Improvement District No.1, City of El Paso, Texas, City of Las Cruces, and the Solicitor General of the United States.

2.6. Potential Impacts of a Supreme Court Decision

One possible effect of a Supreme Court ruling in favor of Texas are groundwater pumping limitations for crops grown in New Mexico such as pecan, chile, and onion. Pecans depend on a constant reliable supply of water and pumping limitations could harm these crops and in turn reduce property values of farmers owning orchards [15]. In contrast to large-scale farming operations, pecan farms in the state are often family businesses and thus farmers face greater risks for pumping limitations and are less able to absorb rising costs of obtaining more water or smaller crops. Pecans generate over \$100 million annually to New Mexico and account for one-third of the country’s pecan production combined with California and Arizona [47]. The New Mexico Pecan Growers (NMPG) [48] worked with the EBID to formulate an equitable settlement of water rights for all crops [49]. The final settlement went beyond pecans to specify water allocations for all crops in the Lower Rio Grande basin in compliance with the Compact. Until this agreement is appealed or the Supreme Court rules on the allocation, water rights will be appropriated as agreed [50,51].

Whereas high use crops like pecans need larger amounts of water, often in excess of the standard allotment, vegetable crops can use less water but it must be more frequent and of a higher quality [34]. New Mexico's strong chile industry generates over \$400 million annually for the state's economy and sustains more than 4000 jobs. The cities of Deming and Hatch, self-proclaimed "Chile Capital of the World," and homes to much of the state's chile crop, have received rain recently, but depend on a heavy snowpack from the northern mountains into the Rio Grande to sustain water supplies [52]. Chile and pecan farmers received twice as much water for irrigation in 2014 as they did in 2013, but this is allotment is lower than their normal water amount. Some farmers argue groundwater is preferable for crop irrigation because it is comparatively cleaner and has fewer plant diseases, but it can be more saline and costly. Using groundwater for irrigation can also be more time-consuming compared to irrigation from river water [53]. As the drought reduces river water, wells pump less and become limited as to how much can be pumped for a single irrigation. Reduced single irrigation can decrease a chile crop yield by 5%, but the reduction for crops like onions could be as high as 30% yield reduction [54]. Without the recharge into the Rio Grande and thus into Elephant Butte Lake and the Caballo Reservoir, the underground water supply and irrigation for cities such as Hatch could be jeopardized, placing economically valuable crops at risk.

A challenge for all three states involved is maintaining water flow to designated critical habitats along the Rio Grande for endangered species under 16 U.S.C. §1533 of the Endangered Species Act (ESA). The ESA's purpose is to protect at-risk species from extinction and from being harassed or harmed. Harm is defined as "An act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering" [55]. In July 2014, Wild Earth Guardians filed suit in federal district court against the Middle Grande Conservancy District, claiming Article 9 ESA violations for the District's diversion of water from the Rio Grande at four separate dams along the river. Wild Earth Guardians claim this diversion has harmed the critical habitat and essential behavioral patterns of the endangered Rio Grande silvery minnow and the Southwestern willow flycatcher [56]. Any resolution to water disputes of the Rio Grande will have to answer ESA situations such as these or face additional litigation.

3. Conclusions

Combined with population growth on both sides of the Mexico-United States border, severe drought projections, increased demand for water, agricultural needs, and the added pressure these all place on the Rio Grande, resolving the allocation issues of the Compact will become increasingly urgent for all states involved. The legal dispute before the Supreme Court may take years and millions of dollars to resolve, including the possibility of the Supreme Court declining to issue a ruling, but the drought and water shortages are pressing problems which New Mexico, Texas, and Colorado need to address soon in order to avoid greater problems in the future.

Conflicts of Interest

The authors declare no conflict of interest.

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