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Where did the Rio Grande Go?

As population continues to increase throughout the world, communities that rely on water from the Rio Grande river for consumption and irrigation grow in size as well. According to the International Boundary and Water Commission, the Rio Grande is the fifth longest river in the United States and spans the length of over 1900 miles, extending from the San Juan mountains of Colorado to the Gulf of Mexico (2020). However, according to AmericanRivers.org, the Rio Grande would be the second longest river in the United States if it still flowed its entire length (2019). In addition, dams and irrigation diversions have impacted the Rio Grande to the point that it has failed to reach the Gulf of Mexico multiple times. The water that flows down the Rio Grande is used by many states including Colorado, New Mexico, Texas, and Mexico. The river provides a source of water for most households and businesses in New Mexico. It is also used to create electricity through hydro-electric power plants. Furthermore, agriculture relies on the Rio Grande to provide irrigation in order to grow food. This food supply is a source of income for many farmers and ranchers throughout the state as well as a food source we as New Mexicans rely on for sustenance. The International Boundary and Water commission states that up to 70% of water usage from the Rio Grande goes to support agriculture (2020). This leaves a mere 30% remaining for other water needs. Whatsmore, the Rio Grande also provides a lifeline for numerous vegetation and fauna that create New Mexico's wildlife habitat including: The Rio Grande Silvery Minnow, Southwestern Willow Flycatcher, and the New Mexico Meadow Jumping mouse - among others.

While consumption through personal, industrial, and agricultural use plays a large role in the depletion of the Rio Grande river, climate change impacts the flow of the river as well. According to the Union of Concerned Scientists, New Mexico is the 6th fastest warming state in the nation (2016). Because of these drastic changes in weather, most of New Mexico's water comes from rain instead of snow fall. This means there's less time for water to be properly absorbed into the aquifers and less of the water makes its way into the Rio Grande river. Ucsusa.org notes that these weather changes are leading to farmers having to dig deeper and deeper wells in order to get the water they need, leading to extraction of water that is more contaminated with heavy minerals and salt, in turn, damaging crops and fouling the soil (2016). According to NOAA, the Rio Grande declined from 2002 - 2012 to the tune of 17% less water flow (2015). Interestingly enough, although the current dry spell is something to behold, it is not the driest the river has ever been. NOAA also points out that the worse drought on record affecting the Rio Grande river system was in the late 1800's when water flowed 27% less water (2015).

A connection that must be made is the role that aquifers play in maintaining river flow. Depleting aquifers leads to rivers drying up. According to AGU, streambeds are the connection between rivers and groundwater, and they control river-groundwater interactions (2017). When we consider the various contributors of groundwater depletion as stated above, we can see that there is not one single solution to this problem. People need to drink water, farmers and ranchers need water for irrigation, and drought continues to worsen. Therefore, solutions must come in the form of innovation and community awareness. Mitigation and adaptation are the key components in transitioning to a new way of living.

The Rio Grande relies on many different states' cooperation and agreement when it comes to sharing the water that the river provides. In these numerous states, the Rio Grande is replenished in different ways as well. Some water is provided via snow melt from high up in the mountains of Colorado while other sources include monsoon season rains. India's river system

mainly relies on heavy monsoon seasons for replenishment. However, they too are seeing major drought conditions. They have been instrumental in leading the way for technological advancements to try to replenish their aquifers and rivers. Remember, depleting aquifers are the main contributor to reduced river flows in combination with drought. According to WeForm.org, 300,00 Indian farmers have committed suicide over the past 20 yrs due to drought (2018). This is an alarming statistic indeed. However, India is attempting to combat their woes by implementing a technique known as aquifer recharging. AGU states that aquifer recharging consists of surface spreading, infiltration pits and basins, as well as injection wells (2017).

Farmers and city dwellers alike are at risk of facing the same plight here in NM if we do not take action to mitigate the current situation we face. It will also take the cooperation of other states who rely on the Rio Grande as well. Unfortunately, the most vulnerable when it comes to the drying up of the river system are people living in rural areas and those who live in poverty. It is noted by USBR.gov that rural communities who are dependent on the Rio Grande for their drinking water get 96% of their water directly from the river (2012). According to e-education.edu, the total number of people who rely on the Rio Grande and related groundwater basins for their drinking water totals 6 million (2019).

In order to combat the dire consequences of depleting the Rio Grande and surrounding groundwater, we must all unite as a larger community and begin preparing for change. We must embrace the idea of aquifer recharging as India has. People of all income levels, cultures, and communities need to conserve water wherever possible. Water usage efficiency is key here. Guidelines have already been set out by the EPA to help us reduce our water usage. For example, in Santa Fe and Gallup New Mexico, residents can receive rebates for WaterSense labeled toilets and other products (EPA.gov, 2020). If every home in NM replaced its existing showerheads with WaterSense models, the state could save 2 billion gallons over water, more than 10 million dollars in water costs, and nearly 20 million dollars in energy costs per year

(EPA.gov, 2020). Imagine the savings if this were upscaled to all the states that share the Rio Grande. The way to make these changes happen is to educate the public and vote for politicians who will fight to change the policies involved in water conservation and innovation. This will include providing monetary assistance to those communities who cannot afford to implement these measures solely on their own.

Climate change is occurring all around us. There is no place on Earth that will not be impacted by the changes our planet is currently going through. Therefore, it is paramount to understand the implications of climate change by being aware that it impacts all creatures, including humans. A united front is what's needed to combat negative health consequences brought about by these changes to our ecosystems. There are many approaches that should be explored but here we will focus on education, policy, and community building.

With education comes knowledge and through knowledge comes awareness. Without education many are left to their own devices and this leads to conflicting messages and lack of continuity. NPR.org states that 80% of parents and 86% of teachers wish climate change education was more abundant in schools (2019). Unfortunately, climate change education is lacking in schools and even when it is taught it's a very brief overview of the theory and not an in-depth lesson plan digging deep into the issue. 65% of teachers say they don't cover climate change subject matter because it is outside their subject area (NPR, 2019). Since schools seem to be lacking the resources to teach about climate change we must make information about it more accessible to everyone. For example, instead of relying on the education system itself to provide all the information, there should be targeted PSA endeavors.

As it relates to the Rio Grande and water conservation, it would be more efficient to break the information down into subject matter that relates to specific communities and regions. At the moment it seems as though there is a big picture approach. We teach about climate change as a whole. How does that relate to the rural and impoverished communities in New Mexico? We

know it is the reason that the Rio Grande is drying up but it can become very daunting if the idea is that we must curb the whole of global warming so that our specific community is not affected, thus leading to complacency. Instead, there should be resources that are relatable to specific communities. Canvassers could go door to door in rural and impoverished areas where internet access may be limited and disperse flyers as well as speak face-to-face with the locals. A quick description of things that can help them preserve water that makes sense to them would be most effective. For example, changing all their toilets and fixtures to low flow types. Maybe the community is unaware that there are grants and/or tax breaks given when these types of upgrades are installed.

Next, we must leverage policy making. First, politicians who prioritize finding effective solutions to climate change need to be voted into office. This way, when it comes time to pass laws and assign tax dollars, the environment is considered with every decision that is made. It would make no sense to go to rural and impoverished communities of the state and ask them to switch out their toilets and fixtures with low flow upgrades if the urban areas were not doing it as well. Tax dollars could be allocated to task force teams that visit dwellings and commercial real estate to inspect for low flow apparatus. Instead of forcing people and businesses to switch over, there could be tax dollars allocated to perform the installs on a sliding scale. Those without the monetary resources available would get assistance while those raking in millions of dollars could tack it onto the expense of running a successful business and receive tax breaks instead. Another great example of how to target specific communities might be to divert some tax dollars to a team who would set up an information booth at a farmer's market in the rural areas. The booth could disperse literature and speak face-to-face with the local communities about things they can do to help preserve the Rio Grande and the resources that are available to help them do so.

Finally, a community effort must be adopted. This will combine both education and policy. Solutions to the problem come from various avenues. If people are unaware of possible solutions and what it would entail to implement them, nothing will ever get done and it will be business as usual. From a policy perspective, if agreements are made across states but are not abided by, then agreements will be ignored and conflict will arise. If all those who are involved feel like everyone has a stake in the outcome of more water resources for them and their communities, then a concerted effort can become successful. It is paramount to highlight the importance of each community's roles in the fight against climate change while also emphasizing the importance of their livelihoods. For example, when it comes to the rural communities of the Rio Grande, rather than saying, "boy you ranchers and farmers sure do use a lot of water and if you don't try to conserve then you are contributing to our demise", you would commend them on their efforts to feed our states. This has the effect of raising communities up which fosters a sense of accountability for the greater good. A little appreciation can go a long way. When people are educated about aquifer recharging, water catchment systems, low flow fixtures, and the positive impact those can make on both the environment and through cost savings in the long run, then policies can be implemented that foster the development and implementation of such solutions. In the end, people need to feel like they are not going it alone, that there isn't one specific group sacrificing more than another. Clear communication through education is the first step. Laws and tax dollars allocated to fund resources and solutions is the second step. Then and only then can a sense of community for the betterment of humanity turn from a utopian dream into a reality of our new future.

As an aside, some things that we might think about moving forward as we face a shortage of clean drinking water might sound very farfetched and outlandish. But in all honesty, to think that the entire globe can live in communes and feed themselves with vegetables and fruits is also not sustainable. The solutions we come up with must be outside the box. We can grow meat in

labs now via Petri dishes and a single cell. If we run the labs off of solar and wind power we have made a huge dent in methane emissions and the need to feed and water livestock, not to mention the need to transport feed and everything else that goes along with that process. When it comes to growing vegetables, we can harness the power of GMOs (people think this is such a negative term but it's only because of how Monsanto has decided to use GMOs and RoundUp to monopolize the market and reap huge profits from it) to create crops that need less water, less fertilizer, and can withstand drought to reduce fertilizer runoff and excess water consumption. We could utilize roof tops for gardens and water them with gray water as well. Might we also be able to divert some of the melting ice from the sea to refill aquifers? I do believe there are solutions, we have great minds and plenty of money, the issue is how we are currently allocating our time and funds to things that actually exacerbate climate change through overconsumption and the desire for instant gratification.

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