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**Decolonizing Water Governance: Water Quality of Indigenous Peoples in California and
Arizona**

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Decolonizing Water Governance: Water Quality of Indigenous Peoples in California and Arizona

Many Native American tribes have creation stories demonstrating the spiritual and cultural significance of water and other resources that they revere. In the Akta Lakota creation story, there was a time when people lived underground, waiting for the Earth as it was being prepared for them. Iktomi, a trickster spider spirit bored with his life on the Earth's surface, decided to play a trick on the humans living underground. With the help of his sole companion Anog-ite, a spirit who was once human, Iktomi ventured into the cave where the humans dwelled, carrying with him a loaded pack filled with buckskin clothing carefully decorated with porcupine quills, different types of berries, and dried meat. The humans, fascinated by Iktomi's gifts and intrigued by his tales of the surface world, were torn on whether to follow the wolf spirit out of the cave, as the Creator had told them to stay underground.

Most humans stayed, yet those who tried the meat followed Iktomi to the surface. Once there, they were left to fend for themselves and struggled to survive because of their inexperience with hunting and the harshness of the ever-changing seasons. The people, realizing they had been tricked, didn't know what to do other than sit outside and cry. The Creator found them and was furious when he learned of what Iktomi and Anog-ite had done. After hearing this, the Creator punished the spirits by turning them into a herd of bison. Time passed and the Creator instructed the rest of the humans to come to the surface. Pointing to the hoof prints, the Creator explained that the bison would lead them to water and anything else they needed to survive.

This story is just one example of the ways Native American tribes have placed vital importance on natural elements, particularly water. Yet, during westward expansion Native Americans were being forced out of their lands and relegated to reservations with a distinct lack

of safe drinking water. This is no more prevalent than in western States like California and Arizona, which have relatively large Indigenous populations in comparison to the rest of the United States. Of the percentage of Native Americans that live in the United States, over half (50.9%) live in five States-- with Arizona and California being among the top three (U.S. Census). Arizona has 12.9% of the total Native American population in the United States whereas California's Native Population has 9.9% of that total (U.S. Census). Native people continue to face the effects of colonization as they live on or around reservations with subpar living conditions, especially as it pertains to water. While acknowledging the historical and current effect colonization has had on Native Americans and their water quality, a question must be asked: Do water facilities in California and Arizona counties with larger populations of Native peoples see more water quality violations than those with fewer Native populations?

Significance & Background

The sunbelt, which extends over the southern coast of the United States, encompasses states like California, Arizona, Texas, and Florida. From the development of the sunbelt through westward expansion, the denial of water rights to the Native people of these future states was extremely prevalent (Wilson, 2021). Not only were Native communities denied the right to water, but they also faced disparities in the quality of the water they could find and use. Disparities involving access and regulation of water lead to problems for these already vulnerable populations. Issues such as kidney disease, cardiovascular disease, neurocognitive disorders, hypertension, and increased probability of cancer are documented in Native communities due to incidences of water contamination (Lewis et al., 2017). Recognizing the contamination of water for Indigenous people and the health concerns they cause; federal and state policies have since been implemented to rectify this concern.

The Clean Water Act of 1974, a policy used to create the baseline for water regulation, was amended in 1987 to allow tribes to apply for "treatment as states" (TAS), granting federally recognized Indigenous tribes the ability to develop their own environmental standards if federal standards are met or exceeded (U.S. Environmental Protection Agency). Because tribes consider cultural and ceremonial uses of water, the quality standards that they implement under TAS tend to be stricter than those of the federal standards (Wilson, 2021). These tribal standards, however, are difficult to enforce due to the complex ownership of land near and around reservations. Referred to as "checkerboard" lands, the use of the land that Natives occupy can be under the jurisdiction of the tribes, the federal government, or non-native residents (Brockman, 1992). All of these often-conflicting interests cause the enforcement of tribal quality standards to be difficult to implement.

Not only do the differing ownership of these jurisdictions lead to less tribal enforcement but they also generate dangerous errors. In 2015, the Navajo community of Sanders, Arizona--a spot close to, but not a part of the Navajo reservation and is mainly comprised of Diné citizens--was made aware of the unsafe levels of uranium in their community water system because of an independent study done by Diné researcher Tommy Rock. The water company and private well were under the authority of the Arizona Department of Environmental Quality, yet despite the many Navajo residents, the Navajo EPA was unable to enforce their quality standards and supervision on the water system of Sanders (Dolan & Middleton, 2015). Although the goal of TAS was to allow tribes to make their own decisions regarding their tribal members, in practice the policy falls short of its intention.

It is also imperative to note that the process of implementing their own environmental standards is difficult for those who seek to. Native populations who desire to follow their own

regulations must be federally recognized, which can be an arduous process due to the documents and tangible proof required (U.S. Environmental Protection Agency). Much of this proof is hard to secure because of the systematic genocide of Native people and their history as well as the tendency for Native populations to pass down history orally- often not relying on written documents or records. If federally recognized, a tribe then must apply for TAS, be approved, submit their own environmental standards, and finally have those standards approved.

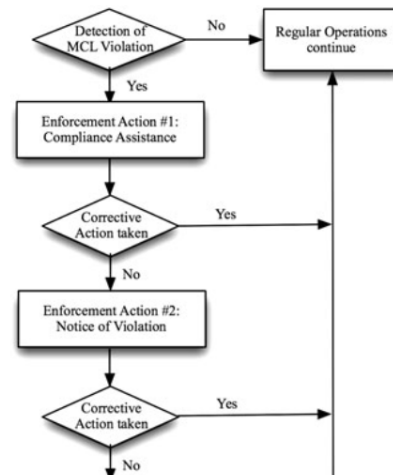
In California, the Integrated Regional Water Management (IRWM) program, a policy designed to provide government-to-government collaboration and co-management, was implemented in 2002 and has since seen many revisions and inclusions (Dolan & Middleton, 2015). Essentially, the IRWM encourages cooperation between tribal and local/state governments through the identification and implementation of water quality management solutions (CA Department of Water Resources). Despite this, the barriers to effective participation in the IRWM lower the effectiveness of the program. To gain tribal participation in IRWMs, tribes are required to "sign on" to the program via the Memorandum of Understanding/Memorandum of Agreement (MOU/MOA), which contains a limited Waiver of Sovereign Immunity (WSI). Many tribes view the signing of the WSI as a major violation of their sovereignty and therefore do not participate in the IRWM program. This causes a lack of tribal participation in a program which is built for that very purpose. In some Regional Water Management Groups (RWMG), there is an "outright refusal" to allow tribal participation on the governing board (Dolan & Middleton, 2015). As such, the obstacles that hinder Indigenous populations from participating in the IRWM inherently make the program ineffective.

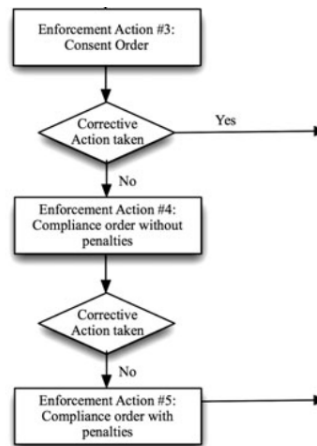
Every year, water quality bills are introduced to the State and Federal legislature, yet not very many are targeted toward Native Americans and even fewer go into effect. Considering the

history of colonization and repression, Indigenous communities are at a disadvantage for decent environmental quality. The issue of water quality is often tied to geography and race, therefore looking at the current state of water violations by both factors is pertinent.

The Safe Drinking Water Act (SDWA) of 1974 created Maximum Contaminant Level (MCL) standards of water quality for the entirety of the United States. The procedure for catching and remedying violations of these standards can be long and arduous, with many steps that hinder proper enforcement. For example, the Arizona Department of Environmental Quality (ADEQ) has five levels of "enforcement", displayed in figure 1, before being able to invoke penalties on the facilities that violate federal water quality standards (Rahman et al., 2010). On the other hand, California's enforcement policy contains a complicated and thorough analysis of the facility violation to determine the amount of money the facility will be penalized with. Factors such as violation history, potential for harm, and ability to pay to continue the business are considered when calculating a monetary penalty (CA EPA). State water quality enforcement is crucial to the understanding of how these violations may affect different groups of people, specifically Native populations.

Figure 1: Levels of Enforcement Action in Arizona





Source: Rahman et al., 2010

Public Water Systems (PWS), systems that utilize public pipes and structures that have at least 15 service connections or serve at least 25 people, are one of the best ways to analyze the true water quality issues as it encompasses all counties and states (Rahman et al., 2010). Community Water Systems (CWS) are a type of PWS that are considered "very small" or "small", serving fewer than 500 or 3,300 people respectively (Rubin, 2013). Many cases of health disparities due to drinking water can be attributed to CWS, for example an estimated 16.4 million cases of acute gastroenteritis each year in the U.S. are traced back to CWS (Allaire et al., 2018). On a county-by-county basis, the reason for the large amount of CWS violations is understudied yet may be able to be traced back to income and rurality levels that are most prevalent in the county (Allaire et al., 2018). Thus, a study of water quality violations should be focused on CWS with a consideration of income and rurality.

Theory & Argument

My research will attempt to answer the question: Do water facilities in California and Arizona counties with larger populations of Native peoples see more water quality violations

than those with fewer Native Populations? My independent variable will be the number of Indigenous peoples, while my dependent variable is the number of water violations. The number of Indigenous people will be shown through the percentage of Native people relative to the other races in 15 counties of both California and Arizona—five counties with the lowest number, five counties with the most moderate number, and five counties with the highest number of Native residents. Within these 30 counties, I will endeavor to display environmental discrimination by making a connection between the Native American population and the number of CWS water violations per 10,000 people in the year 2023, which is the year with the most recent data. Therefore, I hypothesize that as the amount of Native people goes up, so too will the number of water violations.

Due to the historical colonization of Native communities and current inefficient water quality policies, a higher percentage of Native residents will show more water quality violations per county. Inefficient water quality policies refer to the TAS and IRWM, both of which contain issues with proper implementation as outlined above. Other possible factors related to the potential outcome of this study will be accounted for. For example, the rurality percentage of each of the 15 counties per state will be added to my research to make a potential connection between Native population and water quality violations. As shown in other studies, rurality may be an explanation for high water quality violations, potentially due to a lack of capacity to comply with water quality standards and fewer resources/funds to properly manage these facilities (Allaire et al., 2022).

The median household income of these counties will also be considered to account for the possibility that money would affect the number of violations, as communities with less income are often more rural and have more financial strain that may affect the proper upkeep and

management of their CWS. The last factor I will analyze is whether the largest tribe in each county of the 30 overall counties has TAS recognition and whether they have a submitted or approved a tribal plan for water quality control. TAS recognition allows individual tribes to gain more sovereignty over their water quality, and they often implement stricter standards than state or federal policies due to their traditional lifestyles which may increase exposure to potentially dangerous water sources (Lewis et al., 2017).

Research Design & Data

My research project, a small-n study, will compare 30 counties-- 15 in California, and 15 in Arizona— that are chosen by their percentage of Native population as found by the U.S. Census (2020). Five California counties, Alpine (~25%), Inyo (~9%), Del Norte (~7%), Humboldt (~7%), Mendocino (~3%) were picked as they are the counties with the highest percentages of Native people. The five counties with the most median Native populations in California are Madera (~1.3%), Calaveras (~1.3%), Ventura (1.3%), Stanislaus (~1.2%), and Amador (~1.2%). The last five California counties were chosen as they are the counties with the lowest percentage of Native residents, those being Marin (~.4%), Nevada (~.4%), Placer (~.4%), El Dorado (~.5%), and San Francisco (~.5%).

Arizona's five counties with the most Native populations are Apache (~72%), Navajo (~43%), Coconino (~25%), Gila (~15%), and La Paz (~15%). The five counties chosen due to them having the most median Native population percentages are Graham (~11%), Pinal (~4%), Greenlee (~4%), Pima (~3%), and Mohave (~2%). Finally, the five Arizona counties with the lowest percentage of Native residents were Maricopa (~2%), Yavapai (~1%), Yuma (~1%), Cochise (~1%), and Santa Cruz (~.6%). The higher percentages of Arizona Native populations in comparison to California can be explained by the number of individuals enrolled in federally

recognized tribes in comparison to California, which contains many Native people from Mexico and South America. Indigenous people from Mexico and South America were not a part of my study as they are not federally recognized in the United States and therefore would not be able to be assessed for TAS recognition, one of my priority variables.

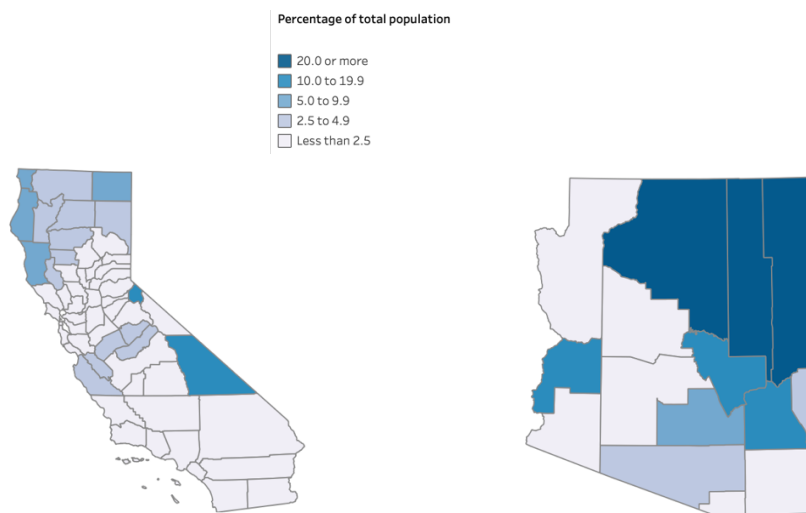
The number of Native people will also be expressed through the number of Indigenous people per 10,000 county residents when being cross-referenced with the amount of water quality violations in each county per quarter of the year 2023, as produced by the U.S. Environmental Protection Agency (U.S. EPA). While considering the number of violations per facility, it was clear that in any given county there are north of hundreds of community water quality facilities, therefore this was not a meaningful variable to explore further. My other factor, median household income, was taken per county from the U.S. Census and grouped by high, medium, and low Native populations as categorized above. Similarly, percent rurality was sourced from the U.S. Census and grouped in the same way as median household income. The data for the last factor, TAS recognition, was acquired through the U.S. EPA and combined with data from the U.S. Census that displayed the highest tribal enrollment of each county. In doing this, the tribes with the highest enrollment in the 30 counties are analyzed for TAS recognition and submitted/approved water quality standards.

Utilizing the quantitative data collected, two box and whisker plots were created—one for Arizona and one for California. The x-axis is the amount of Native people in 15 counties divided into the three previously described sections (low, medium, and high). The y-axis is the number of violations per 10,000 county residents in each of the four quarters of 2023. The four quarters of the year are each displayed in the chart as a different color to be able to better visualize the changes between the quarters.

Rurality and median household income are both displayed in the form of a bar chart. For rurality, the x-axis is the Native population divided into the three categories of high, medium, and low, while the y-axis is the percent rurality. The x-axis displays the two states, California and Arizona, next to each other while grouped by Native population in order to properly compare all the variables. The graph used to demonstrate median household income has an x-axis of Native population, very similar to that of rurality, while the y-axis is the median household income.

On the other hand, TAS recognition is presented in the form of a chart for both California and Arizona. These charts display the most populous tribe in each county and whether they have TAS recognition, a submitted plan for water quality standards, and/or an approved plan. To contextualize this better, maps displaying the number of Indigenous populations across all of California and Arizona by county are sourced from the U.S. Census (figures 2&3). The maps show the population of Native peoples through different shades to display the approximate amount of Indigenous people through percentages.

Fig. 2&3: Percent American Indian and Alaska Native by Total Population, 2020



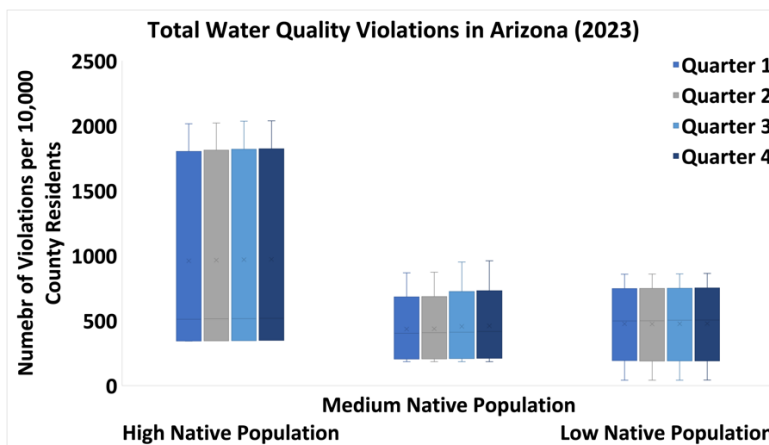
Source: Census.gov

In my study, the variables are consistently measured as they are often from the same data sources. A way in which my study could be better improved for reliability and validity is to evaluate other races and years. Due to my limitations on time and resources, I was only able to analyze water quality violations as they pertain to Native populations in the year 2023. Currently, the reliability and validity of my factors are sufficient for displaying my findings and potentially supporting my hypothesis.

Findings & Analysis

My hypothesis-- as the amount of Native people goes up, so too will the number of water violations—was supported by my findings, particularly in my box and whisker plots. In Arizona, analysis of the number of violations and Native population showed a higher number of violations in the five counties with high Native residents. There was also a larger range of violations for the counties with high Native populations, ranging anywhere from around 400 violations to 2000 violations. Results also showed a distinct lack of variation between the quarters of the year, meaning that on the scale of a single year, there is not much change in number of violations.

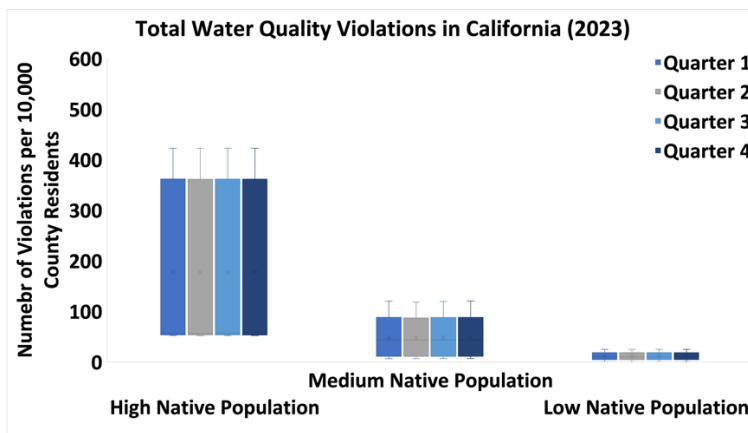
Figure 4



Data Source: EPA Water System Summary & U.S. Census

California follows generally the same trends seen in Arizona in terms of water quality violations in counties grouped by Indigenous population. The five counties with high Indigenous populations saw a higher number of and larger range of violations, which were anywhere from about 50 to 425 violations. The variation between the quarters was even less than that of Arizona, showing virtually no change.

Figure 5



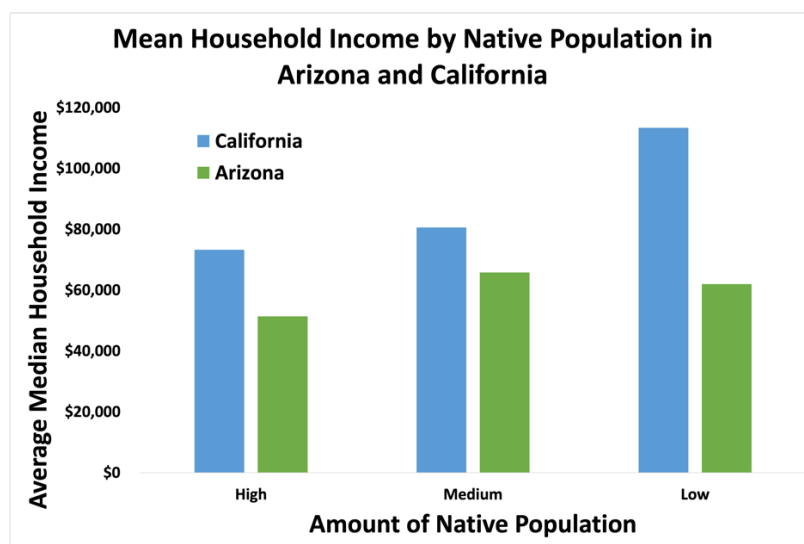
Data Source: EPA Water System Summary & U.S. Census

One interesting finding was that the number of violations in Arizona is significantly more than those in California. I believe that an entirely different study is needed to understand exactly why this is, however, in pure speculation, it could be due to the amount of water bodies in Arizona with a capacity for potential violations or better water quality enforcement mechanisms in California as displayed by the California Water Boards and the ADEQ.

Median household income also has a relation to the amount of Native people as the bar chart (Figure 6) shows lower median income relates to higher Native population, which is the case for both California and Arizona. The spread also reflects the higher overall median income of California, creating a more fluid distribution from low to high median income. The bars for

Arizona show that while counties with high Native populations have lower median incomes, counties with medium amounts of Native populations have higher median incomes than those with higher amounts of Native populations. Due to this, we can make the conclusion that counties with higher violations not only have more Natives in their populations but also have lower median household incomes.

Figure 6

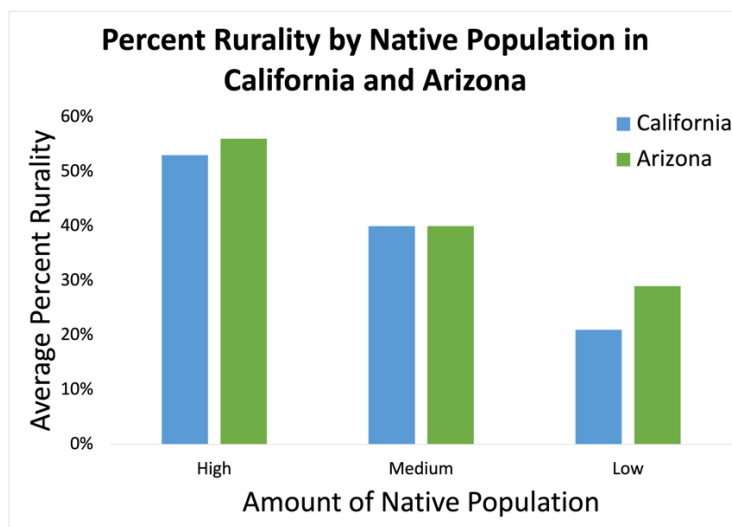


Data Source: U.S. Census

In order to better contextualize my main findings, rurality was also analyzed. In the bar chart comparing percent rurality with Native population in California and Arizona (Figure 7), higher Native populations were related to higher rurality. In the 30 counties analyzed for this chart, Arizona seems to have a higher rurality percentage overall. The 10 counties that accounted for the medium amount of Native population-- five for California and five for Arizona—displayed the same average percentage, suggesting that the number of violations in those

counties, seen in figures 4 and 5, are not necessarily subject to rurality. Overall, counties with higher violations have higher Native population and rurality.

Figure 7



Data Source: U.S. Census

The last factor I accounted for was TAS recognition as it operationalizes how much sovereignty Native people have over their water sources. In California, many of the counties had a high population of enrolled Cherokee, Apache, and Navajo members- all of which do not have TAS recognition. The fact that these tribes have no TAS recognition also means that they have no submitted or approved water quality plan. Two counties, Alpine and Inyo, have the highest population of Paiute enrolled tribal members. Three out of the four Paiute bands of California have TAS recognition and a submitted and approved water quality plan. One of those bands has TAS recognition but does not have a submitted or approved water quality plan, which could suggest it is ongoing. Therefore, the most populous tribe of the two counties with the highest percentage of Native peoples in California have increased water sovereignty, as recognized under the federal government. Many other tribes seen in the table (figure 8), such as Navajo, Sioux, and

Cheyenne are TAS-recognized in other states. This could mean that the amount of federally enrolled individuals are not populous enough, which causes them to have less money and resources to be able to gain TAS status and water quality plan.

Figure 8: TAS Recognition in 15 California Counties

Counties	Largest Tribe	TAS Recognition	Submitted Water Quality Plan	Approved Water Quality Plan
Alpine	Paiute	Y	*3/4 Y	*3/4 Y
Inyo	Paiute	Y	*3/4 Y	*3/4 Y
Del Norte	Cherokee	N	N	N
Humboldt	Choctaw	N	N	N
Mendocino	Apache	N	N	N
Madera	Creek	N	N	N
Calaveras	Choctaw	N	N	N
Ventura	Apache	N	N	N
Stanislaus	Cherokee	N	N	N
Amador	Cheyenne	N	N	N
San Francisco	Apache	N	N	N
El Dorado	Sioux	N	N	N
Placer	Cherokee	N	N	N
Nevada	Navajo	N	N	N
Marin	Navajo	N	N	N

*3/4 bands of Paiute Indians who have TAS recognition have submitted & approved water quality control standards

Data Source: U.S. Census

In contrast, many of the most populous tribes in the counties of Arizona have both TAS and a submitted and approved water quality plan. This could be traced back to the fact that the most populous tribe in eight of the 15 counties of Arizona is the Navajo Nation. Those that are outliers, meaning those that do not have TAS recognition or a submitted and approved water quality plan, are towards the bottom of the chart (figure 9), showing that the outliers have fewer Native residents. Two outliers are in the medium amount of Native population and one outlier is

in the low amount of Native population. This means that the counties with fewer Native people also have less water sovereignty as recognized under the federal government.

Figure 9: TAS Recognition in 15 Arizona Counties

Counties	Largest Tribe	TAS Recognition	Submitted Water Quality Plan	Approved Water Quality Plan
Apache	Navajo	Y	Y	Y
Navajo	Navajo	Y	Y	Y
Coconino	Navajo	Y	Y	Y
Gila	Apache	Y	Y	Y
La Paz	Navajo	Y	Y	Y
Graham	Apache	Y	Y	Y
Pinal	Pima	Y	Y	Y
Greenlee	Apache	Y	Y	Y
Pima	Tohono O'Odham	N	N	N
Mohave	Yuman	N	N	N
Maricopa	Navajo	Y	Y	Y
Yavapai	Navajo	Y	Y	Y
Yuma	Yuman	N	N	N
Cochise	Navajo	Y	Y	Y
Santa Cruz	Navajo	Y	Y	Y

Data Source: U.S. Census

Policy Suggestions

Based on the background and findings, the current state of water policy does not properly incorporate Indigenous needs or voices, despite the programs put in place to collaborate with tribal communities. Therefore, a refinement of these programs, such as the IRWM and TAS recognition, is crucial to allow for the original purpose of these policies to be correctly implemented. Improving the IRWM in California cannot be done without the allowance of Indigenous people on the governing board for each region, referenced above as the RWMG. It is

also pertinent that tribes and Native people are able to obtain proper information on these programs, preferably from trusted sources or community members. This would combat the notion that Native people have about the Waiver of Sovereign Immunity (WSI) being a major infringement of their sovereignty. If this education is not able to increase IRWM tribal participation, then a revision of the IRWM, specifically the WSI, may be needed. It may be the case that the WSI needs to be removed completely or majorly amended to not be a significant infringement on Native sovereignty.

Refining TAS recognition looks slightly different than IRWM modification in that I believe monetary support may be needed. Research on this topic pointed to the idea that tribal communities with fewer people and resources are not likely to have TAS recognition, therefore financial assistance to those tribes who may want to obtain TAS is necessary. With potential monetary aid, tribes would be able to hire people to aid them through the TAS application and the water quality control process. These kinds of regulatory standards are hard to enforce in Native nations due to the "checkerboard" state of their territories, meaning that tribal communities have inconsistent jurisdiction over the land and water that they utilize (Brockman, 1992). In knowing this, the current movement of "LANDBACK", a campaign seeking to get Indigenous lands back in the hands and stewardship of Indigenous people, is a viable option to allow for the improvement of the federal TAS program (NDN Collective, 2020). Giving land back to Native populations will encourage the end of the current fractured state of Indigenous territories, which will enable Native participation in federal and state programs that seek collaboration.

When considering future policies that endeavor to tackle Native water issues, Native water sovereignty should be the ultimate goal that is being actively worked towards. If

Indigenous people can have control over their own water and land sources, water quality will presumably improve due to the fact that tribes set more stringent water quality standards than federal or state standards (Dolan & Middleton, 2015). It is also crucial that Native issues are considered when creating general water policy, as water quality is more likely to affect Native populations on account of their traditional lifestyles, which may increase exposure to potentially dangerous water sources (Lewis et al., 2017). If considering collaboration with Native individuals and tribes, future policy must be increasingly inclusive and nondiscriminatory.

Conclusion

Water holds a lot of cultural and religious importance to the Indigenous people of Arizona and California, meaning that including and accounting for Native people in water policy should be of high priority. This is especially prevalent considering the more traditional lifestyles Native people live, exposing them to potentially dangerous water sources. Historical discrimination relegated Native people to lands that had substandard water quality, therefore I sought to analyze what a contemporary analysis of Indigenous people's water would show.

I hypothesized that as the amount of Native people went up, so too would the number of water quality violations. This theory was supported by the box and whisker charts I created that compared the amount of Native people in different California and Arizona counties with the number of water quality violations. In order to support and give more context to the main findings, I examined other factors such as TAS recognition, median household income, and rurality.

For further research, I would suggest looking at contamination violations separately to narrow the study down further and place more attention on the dangers these violations may

pose. Looking deeper into the distribution of the quarters of multiple years would be interesting to analyze the change, if any, over a longer period of time. Along the same lines, adding different years to my already existing study would facilitate potential findings of a specific trend occurring across these states.

My findings supported disparities in water quality for Indigenous populations in two of the five states with the most Native residents. Clearly, the lack of attention on this issue allows it to continue and become a formidable obstacle for Native people. Therefore, the recommended policy solutions should start to be discussed and considered for implementation.

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