Our Summary

Lake Mead, a Colorado River reservoir, serves 25 million people. However, its water levels are steadily declining, with record low water levels reported during its 2021 summer drought. Our task was to analyze trends and possible solutions to the drought. First, we created a model to predict water levels in the future based on the current drought and historical data. Then, we established a plan that encapsulates a solution to this drought using wastewater recycling.

Our first goal was to identify how the water volume at Lake Mead changed annually by analyzing the inflow, outflow, and loss. We identified Arizona, Nevada, Mexico, and California as the main regions to receive water from Lake Mead. Through our research, we found the amount of water annually sent to these regions. Additionally, we found that Lake Mead receives a set amount of water every year, which we used to account for its total inflow. Then, we found the average evaporation from Lake Mead per year. After finding the inflow, outflow, and loss, we determined an annual deficit in water volume, which could have contributed to the declining water levels at Lake Mead. Therefore, we determined fixing this system as a priority.

Before this, we had to analyze the droughts, identify their periods, and define their beginnings and ends. We analyzed monthly elevation data from Lake Mead [5] and determined the percentage changes between each month's elevation. We defined the beginning of a drought as the first negative change and the end of a drought as the first positive change.

Then, we examined the relationship between volume, surface area, and elevation of Lake Mead by assessing the data needed for this, such as the average depths extending from the inside to the outside of the lake and the area covered at these depths. We concluded that by using this data, one could verify area, volume, and elevation and the relationship between these values.

In our first model, we determined the beginning of 2021 as the start of the most recent drought and converted the January water elevation level in this year to a water volume value. We determined a pattern for the changes in water volume through the years and used this pattern to determine the January water volume over time. We then converted these values back to water elevation levels and used the water level pattern in 2021 to predict the water elevations in the years 2025, 2030, and 2050. For our second model, we created two versions. One version takes in the entirety of monthly water level data for the past 15 years, and another version removes the significant spike in data in the years 2011-2014, where an abnormal amount of inflow was introduced. Both versions yielded similar predictions for 2025 and 2030, but there was a variation for predicting water levels in the year 2050.

When considering how waste-water recycling could be a potential solution to prevent drought and restore Lake Mead's water volume, our priority was to minimize the water needed from Lake Mead. We included the states California, Arizona, and Nevada in our plan since these states receive the most water from Lake Mead. We considered several factors: the amount of water that they receive, these states' governments and their attitude towards the droughts at Lake Mead, these governments' efforts toward water conservation, and the cost of recycling water. Then, we organized a plan to combat decreasing water levels of Lake Mead. Our program concentrated on implementing additional water recycling facilities in California, where local leaders are already focused on spending money on water infrastructure. We focused on using a portion of the California Comeback Plan on water recycling efforts. We then assessed the benefits and drawbacks of our plan by analyzing the effect that it would have on Lake Mead's water level and its cost. Finally, we reported our strategy and our findings in a non-technical news article.

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1. Introduction

1.1 Background

Climate change has greatly affected our environment and resources. Due to intense weather caused by climate change, droughts have become more frequent throughout the world. One of the places most affected by this is Lake Mead, a Colorado River reservoir on the Nevada-Arizona border and the largest reservoir in the country. Lake Mead serves 25 million people in several US states and Mexico; many are dependent on Lake Mead for water and even electricity. However, the water levels at Lake Mead have been declining with record low water levels during the summer of 2021. This recent drought has caused the Bureau of Reclamation, an organization that manages operating conditions at Lake Mead, to announce cuts in Lake Mead's water supply, set to start in 2022 [3].

1.2 Question Restatement

The objective is to analyze the impact of droughts on Lake Mead and recycling wastewater as a solution to water shortages. There are four parts to this plan:

1. We must find the factors that impact inflow, outflow, and loss in Lake Mead, the relationship of these factors, and how they affect water level and volume and Lake Mead.

2. Since Lake Mead has an irregular shape, we cannot easily calculate its volume, surface area, or surface elevation level. Therefore, we must ascertain the relationships between these values and verify them.

3. The first step to solving the drought at Lake Mead is to identify drought periods at Lake Mead. In order to do this, we must develop criteria to define a drought period and investigate a consistent method to identify the beginnings and ends of drought periods. This must be done by analyzing historical data for Lake Mead water levels since these criteria and methods must hold true for all Lake Mead droughts throughout the years.

4. Since our goal is to solve the drought issue, we must predict how this problem would continue on to future years if unaddressed. We must consider water level data from both the recent drought and throughout history. Then we can develop models using this data to predict water levels over time. Using these models, we can predict water levels in the years 2025, 2030, and 2050. This will help us better understand the drought crisis at Lake Mead.

5. Wastewater recycling is a potential solution to the drought crisis. Using the models, we must determine if wastewater recycling is a viable solution to match future water demands. Then, we can analyze the factors which would impact recycling wastewater for different states, such as their local government, and create a plan based on our analyses. Then, we must discuss how the plan would be measured based on impact.

6. Finally, we must create a non-technical news article that reports key takeaways and reports from our investigation in order to share our conclusions with the public and give a call to action.

2. Assumptions

2.1 Assumptions and Justifications

Inflow, Outflow, and Loss

1. There is an average annual evaporation rate of 6.22 ft [14].

   Justification: The data for this value is taken from a 2013 to 2019 study. The long period of this investigation validates the evaporation value. We can account for a static evaporation value by analyzing the trends in the water elevation level data.

Model 1

1. Lake Powell will have recovered enough water by 2026 due to drought regulations that it can return to the previous release amount of 8.23 acre-feet to Lake Mead annually.

   Justification: Lake Powell does not supply as much water as Lake Mead, and its outflow is being significantly reduced in the 2022 operating conditions [3]. We assume that, by 2026, Lake Mead will be deemed a higher priority for drought prevention.

2. 2026 operating regulations for Lake Mead will continue till 2050

   Justification: Since no information about other dates to consider operating conditions has been announced, we must assume that the decisions made in 2026 will continue till 2050.

Our Plan

1. California will be willing to spend a large part of its comeback plan on water recycling efforts.

   Justification: California leaders have already devoted large amounts of money to water infrastructure; therefore they will be willing to spend more money on new infrastructure plans.

3. Elevation, Area, and Volume Relationships

The elevation, area, and volume of Lake Mead all have corresponding relationships. However, in order to verify a relationship between these different values, additional data is needed. First, we analyzed the relationship between elevation and volume. One way of determining a relationship between these variables is identifying a mathematical function between them that could be used to estimate the volume based off of the elevation. In order to create this function, sonar or lidar data would be needed to gage the depths of Lake Mead in the different locations. In addition, the surface areas at these varying depths would be neccesary. This data could be used to identify the volume based on elevation in different locations of the lake. In order to do so, a simple volumetric analysis could be used to estimate the volume of the lake at different elevations where the elevation of the lake's floor stays fairly consistent. First, the depths of the lake could be divided into varying parts and then averaged, so as to determine different portions of the lake that share a level depth. The data for the surface area of these different elevations could then be taken and used to determine the volume of these portions. Since the lake would be manipulated into a reverse pyramidal shape, the base volume with the lowest surface elevation would be summed with the volume of the preceding elevation, whose depth elevation was that of the previous surface elevation. This pattern of summing could be carried on to determine the volume of other greater elevations. The resulting relationship is an almost exponential one. The width of the lake increases at increasing elevations, causing the surface area of the water to expand, and therefore increasing the volume of the lake.

Using data points calculated from the previously explained method, a relationship representative of the pattern just described could be determined. Likewise, this could be done by using existing volume, surface area, and elevation data and fitting a model to these data points. We used excel software and elevation, surface area, and volume capacities to visually model and verify these trends from 2010 data of Lake Mead [6]. The resulting equations and graphs are shown for the function of volume as the result of elevation, surface area as the elevation, and volume as a result of surface area. The equations verify the data by displaying reasonable trends from the provided data.

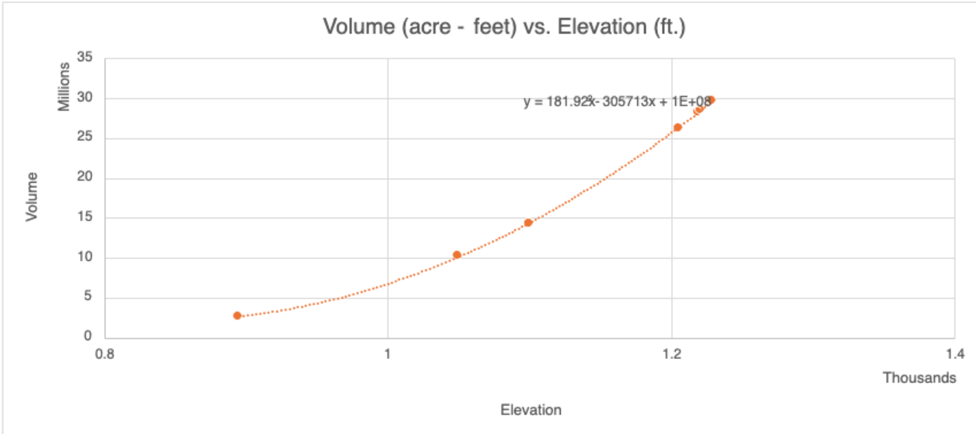


Fig. 1: Elevation (ft.) vs. Volume (acre-ft.) model for Lake Mead

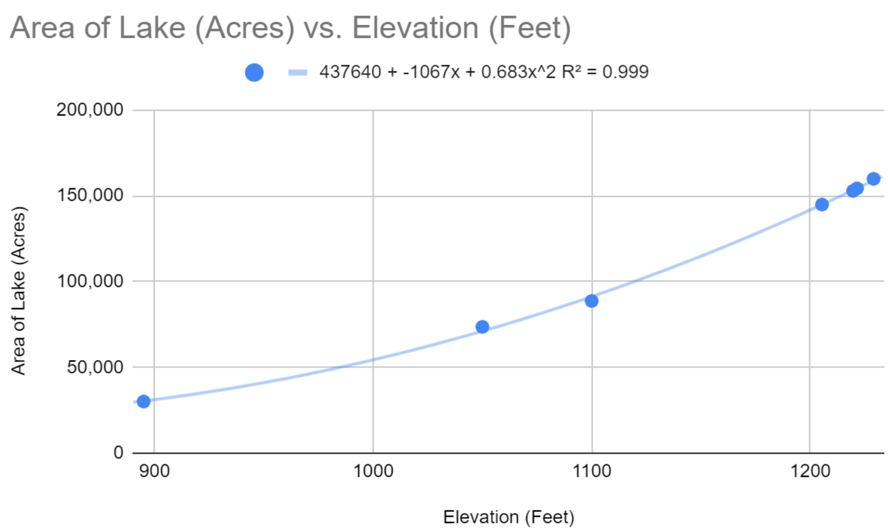


Fig. 2: Elevation (ft.) vs. Surface Area (acres) model for Lake Mead

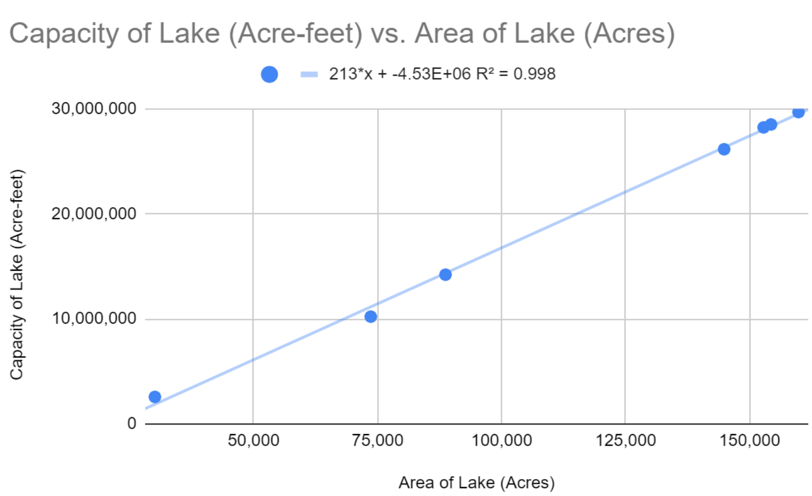


Fig. 3: Surface Area (acres) vs. Volume (acre-ft.) model for Lake Mead

4. Inflow, Outflow, and Loss

Considering that inflow to Lake Mead can be attributed to three sources: the Colorado River, its tributaries, and precipitation, where inflow from the Colorado river accounts for 96% of the inflow, the first step in our process was to find the annual inflow from the Colorado River to Lake Mead. Through our research, we found that the Glen Canyon Dam, the dam for Lake Powell which is situated upstream on the Colorado River from Lake Mead (Fig.1), is required to release a minimum of 8.23 million acre-feet annually is accordance with the Article II(2) of the Coordinated Long-Range Operating Criteria [1].

Fig. 4: Colorado River Basin Map [2]

Since the Colorado River accounts for 96% of the total inflow, we can calculate the total inflow based on the 8.23 million acre-feet from Glen Canyon Dam. Therefore, we found that the total annual inflow, at minimum, to Lake Mead, would be 8.57 million acre-feet.

Next, the outflow from Lake Mead had to be found. Using the new allocations to Nevada, Arizona, and Mexico in 2022 [3] from the Bureau of Reclamation, we found the original allocations to these states. The new water allotment to Arizona is 512,000 acre-feet less than the old one, or 18% less than state's annual apportionment. Using these values, we found that the original allocation to Arizona was about 2.84 million acre-feet. The new water allotment to Nevada is stated to be 21,000 acre-feet less than the old one, or approximately 7% less than the state's annual apportionment. From that, we found that the original allocation to Nevada was 0.3 million acre-feet. The Bureau of Reclamation also stated the new apportionment to Mexico: 80,000 acre-feet less than the original allocation, or about 5% less than the original allotment to the country. Therefore, the original allocation would be about 1.6 million acre-feet.

Through further research, we found that California also receives water from Lake Mead, with the largest annual apportionment. California did not face any cuts in their water allotment in the new 2022 operating conditions, however, so their apportionment was not mentioned. According to The Metropolitan Water District of Southern California, California receives an allotment of 4.4 million acre-feet annually [4]. Using this value, we found a total outflow of 9.14 million acre-feet.

Finally, we researched the average loss of water volume through evaporation from Lake Mead. According to a 2013 to 2019 study from the U.S. Geological Survey [14], the mean annual evaporation from Lake Mead was about 6.22 ft. However, this number cannot be compared to the other values since it is an elevation measurement rather than a volume measurement. In order to convert this value, we averaged the January elevation level data [5] from 2013 to 2019, in order to find the average starting elevation level for each year during the study. There was an average starting elevation of 1094.66 ft., and we subtracted 6.22 ft from this value to get a final elevation of 1088.43 ft. These elevation values were then compared to volume measurements using the previously mentioned Elevation (ft.) vs. Volume (acre-ft.) model. We calculated a starting volume of 1.38316 million acre-feet and an ending volume of 1.3262 million acre-feet. Therefore, there was an average loss of 569604 acre-feet or .5696 million acre-feet due to evaporation from Lake Mead.

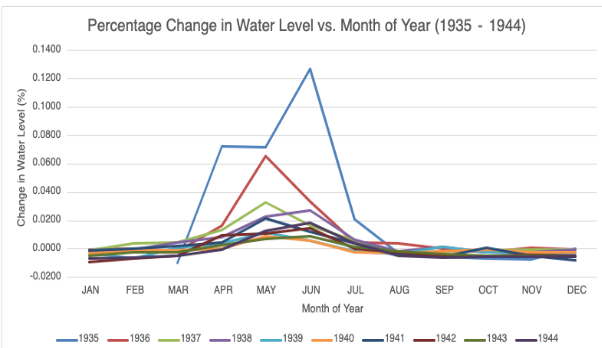
To calculate the total change between each year, we can subtract the outflow and loss from the inflow. When we subtracted the total outflow of 9.14 million acre-feet and the average loss of .5696 million acre-feet from the total inflow of 8.57 million acre-feet, we found an annual decrease in water volume of 1.1396 million acre-feet. This means that, even without climate change worsening, there is a built-in annual deficit of water in Lake Mead.

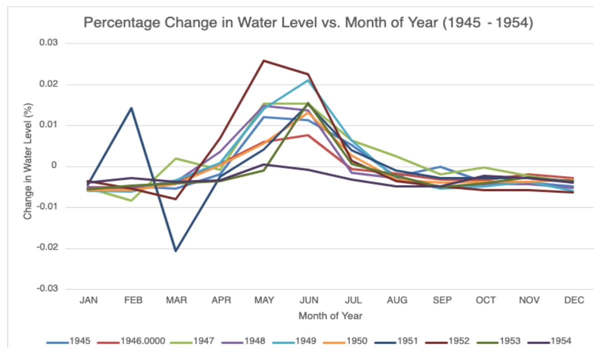
Under the new operating regulations for 2022, the total outflow would be the new apportionments to the states added together, which we found to be 8.531 million acre-feet. The inflow from the Glen Canyon will also be decreased to 7.48 million acre-feet. Therefore, the total change would be the total outflow and the average loss subtracted from the inflow, or a deficit of 1.051 million acre-feet, annually.

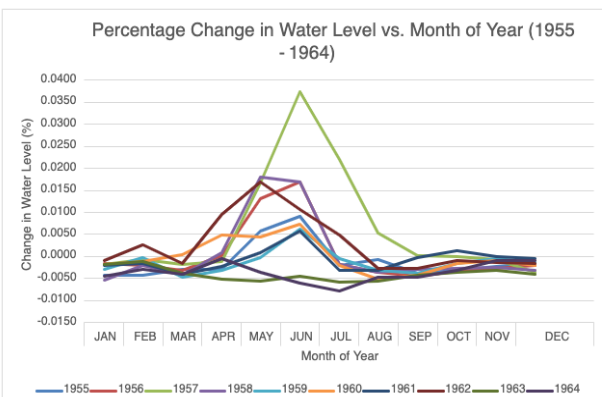
5. Drought

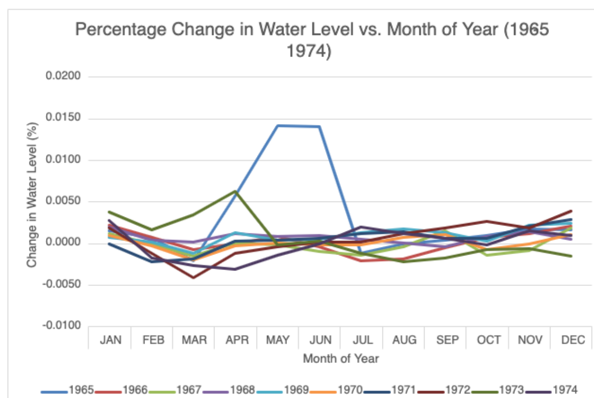
As we analyzed the monthly elevation data at Lake Mead provided by the Bureau of Reclamation, we found that water levels were decreasing throughout the years, which matched our calculations of the deficit in annual water volume. We also noticed that water levels decreased for a few months every year, and we decided to identify these annual intervals of lower water levels as the yearly drought period. Although these intervals can continue into another year, they occur over a span of months rather than years, so we decided to define each decrease in water level which lasted longer than a month as a drought.

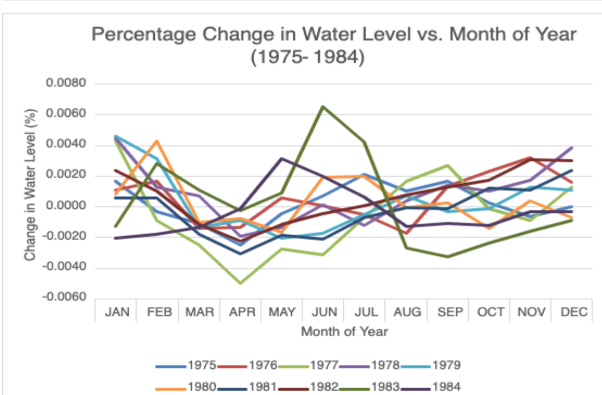
While just analyzing the water elevation levels helped define our criteria for a drought, we needed a more solid method to identify the beginning and end of the drought. To do this, we analyzed the percentage change in water level between each month in all the monthly elevation data provided to us, spanning from 1935 to 2021.

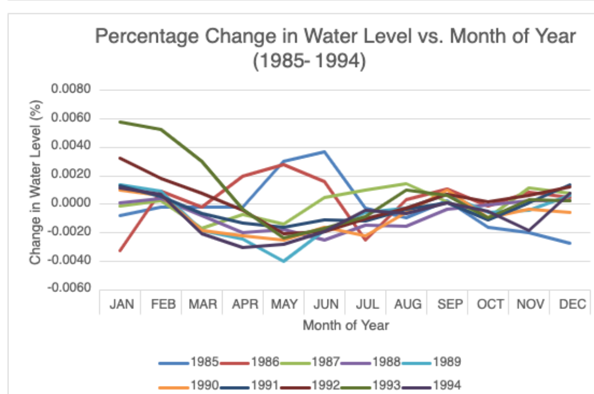












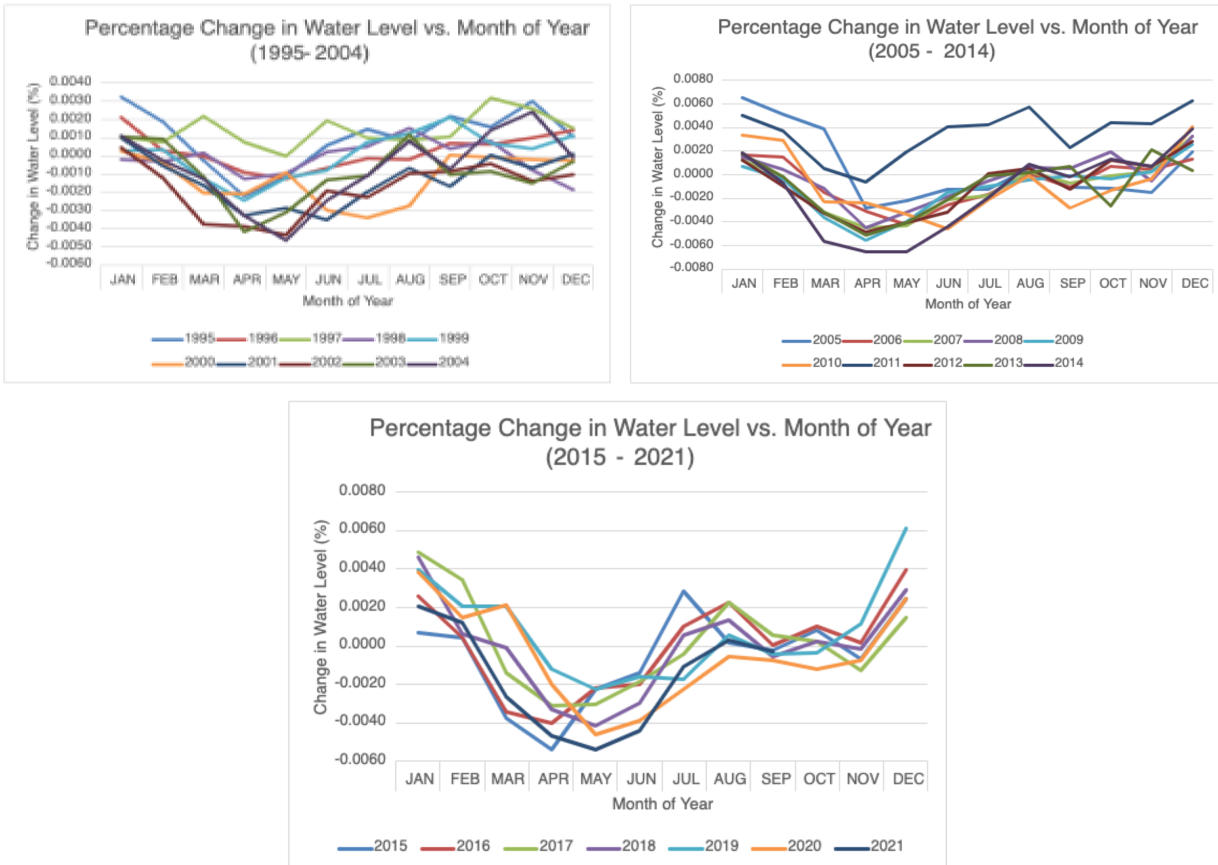


Fig. 5: Graphs for Monthly Percentage Change in Water Elevation Level from 1935-2021 at Lake Mead

Based on these graphs, we decided to identify the beginning of a drought as the first decrease in water level or negative percentage change in water level. The end of a drought is identified as the first increase in water level or positive percentage change after at least two months of decreasing water elevation levels. We consider the interval after this point as the drought recovery period.

These graphs emphasize the effects of climate change on water levels at Lake Mead. Each successive year has more drastic decreases and increases in monthly water levels than the last, which can be explained since climate change causes more intense weather - more droughts and more storms [10]. The most recent drought, from February to August in 2021, shows the greatest percentage decrease in water level each month than any year before it. Droughts are getting more drastic and intense at Lake Mead due to climate change, and the annual deficit in water inflow, outflow, and loss adds to these declining water levels. To help restore Lake Mead to its initial water levels, it is crucial to first fix the standard operating conditions of Lake Mead so that the lake is not losing water every year.

6. Predicting Future Lake Mead Water Levels

Model 1

In our approach to predicting future water levels using recent drought data, we identified drought periods with consistent decreases in water level, as stated earlier. Since the water levels increased slightly at the beginning of 2021, we decided to consider this year a different drought period. We identified the most recent drought's time frame as being from the beginning of 2021 to October 2021, the last monthly elevation data point given.

Since we did not have several years to predict trends from, we decided to predict the water level changes between each year using the change in volume. First, we converted the elevation value for January of 2021 into a volume value using the Elevation (ft.) vs. Volume (acre-ft.) model. Then, we subtracted the calculated deficit of 1.1396 million acre-feet from this first volume value to get the volume value for the next year. Considering that the drought regulations are started in 2022 and then reviewed in 2026 [7], we subtracted the calculated annual gain of 1.051 million acre-feet to the water volume levels from years 2022-2026. Then, for the years after 2026, we considered that Lake Powell's water levels could have recovered at this point, while Lake Mead's levels were still decreasing. Therefore, we assumed that the annual release from Lake Powell would be reverted to 8.23 million acre-feet in 2026. We calculated a new deficit of .301 million acre-feet and subtracted this value from all of the years following 2026.

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
January Water Volume (acre-ft.)	13039228	11988228	10937228	9886228	8835228	7784228	7483228	7182228	6881228	66580228	66279228	55978228	55677228	5376228	5075228

Year	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
January Water Volume (acre-ft.)	4774228	4473228	4172228	3871228	3570228	3269228	2968228	2667228	2366228	2065228	1764228	1463228	1162228	861228	560228

After finding these initial water volume values, we converted the water volumes for the years 2025, 2030, and 2050 into water level values using a linear equation fitted to the elevation and volume data provided by the Bureau of Reclamation [6]. We used the equation $y = 84650x-75841300$ to convert the volume values. We found that our predicted January water level values were 1000.31 ft. for 2025, 973.67 ft. for 2030, and 902.56 ft. by 2050.

Then, we looked at the percentage changes between the water levels of each month in 2021, which we used to determine drought periods earlier, to project the same pattern of decreases and increases in future years. By using these percentages to maintain the same pattern, we were able to predict the water levels of future years if they were following the same trends as the most recent drought in 2021.

	% Change	0.0021	0.0012	-0.0026	-0.0047	-0.0054	-0.0044	-0.0010	0.0003	-0.0003
Year										
2025	1000.31ft.	1002.37 ft.	1003.58 ft.	1000.93 ft.	996.23 ft.	990.88 ft.	986.51 ft.	985.48 ft.	985.76 ft.	985.50 ft.
2030	973.67 ft.	975.68 ft.	976.85 ft.	974.28 ft.	969.70 ft.	964.49 ft.	960.24 ft.	959.24 ft.	959.51 ft.	959.26 ft.
2050	902.56 ft.	904.42 ft.	905.51 ft.	903.12 ft.	898.88 ft.	894.05 ft.	890.11 ft.	889.17 ft.	889.43 ft.	889.20 ft.

Therefore, we can predict that water levels will range from 1000.31 ft. to 985.50 ft. in the year 2025, 973.67 ft. to 959.26 ft. in the year 2030, and 902.56 ft. to 889.20 ft. in 2050.

Model 2: Version 1

For this model, we only utilized water level data from 2005-2020 to evaluate and predict water levels in Lake Mead. The data provided to us on the water elevation by the end of the month each year was the main resource in our model [5]. For our first step, we analyzed overall trends in the 16 year time period to have a baseline to compare our predictions to. We used Excel to model the water levels by month:

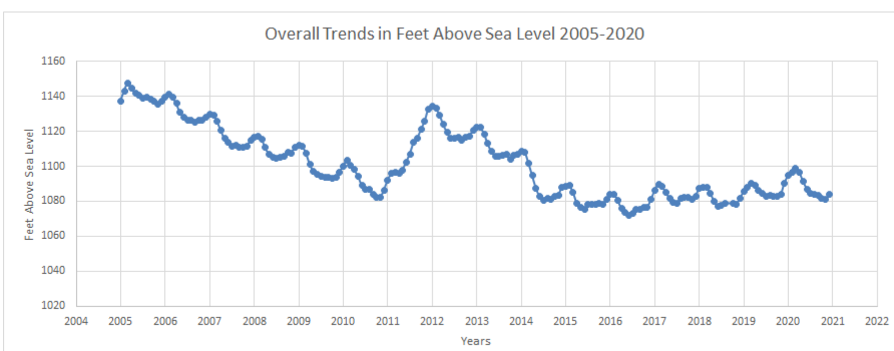


Fig. 6: Over the years, the water elevation levels declined, with a sharp incline in the year 2011. This was due to Lake Powell releasing an abnormally large amount of water that year. After this release, the water levels returned to a steady pattern.

From here, we had created two models to predict the water levels for the years 2025, 2030, and 2050. One method did not account for the introduction of large inflow of water in the year 2011, which may have interrupted the pattern, while the other accounted for the spike by removing it from the dataset.

In the first method, we averaged the curves of the trends from the years 2005-2020 by month to predict the monthly trends of future years. By averaging the curves for all twelve months and using that to predict water elevation, our model is able to account for patterns in the previous years and generate patterns that are consistent. The monthly predictions of water elevation for the years 2025, 2030, and 2050 are shown below:

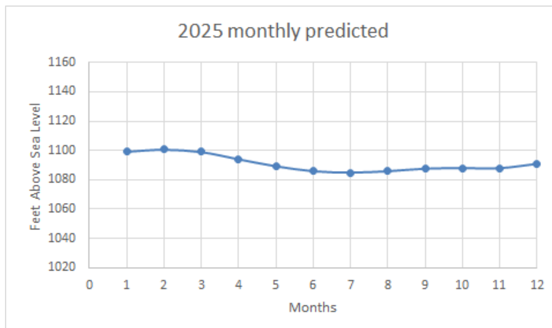


Fig. 7: In this figure, the predicted elevation of water in feet above sea level for the year 2025 starts at 1100 in January, and then declines to around 1085 in July, to then increase to around 1091 in December with a small dip to around 1088 in November.

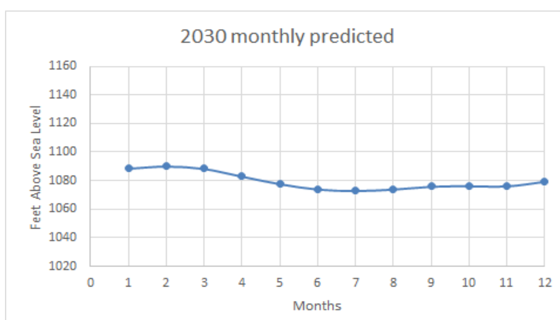


Fig. 8: In this figure, the predicted elevation of water in feet above sea level for the year 2030 starts at around 1089 in January, and dips to about 1073 in July, and increases to around 1078 in December with a small decline to about 1076 in November.

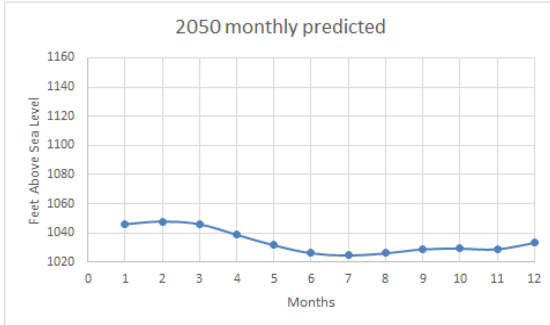


Fig. 9: In this figure, the predicted elevation of water in feet above sea level for the year 2050 starts at around 1046 in January, and declines to about 1025 in July to then increase to around 1033 in December with a small dip in November to about 1029.

Model 2: Version 2

Based on the figures above, it is apparent that the water levels in Lake Mead are steadily decreasing over the years, and in 2050, it is predicted to reach a record low of 1025 feet above sea level, while in 2005, the lowest water level was only around 1135 feet above sea level. Once we completed this model, we came to the realization that the large inflow of water in 2011 would affect the pattern and the accuracy of the model. It takes a few years for the levels to return to a steady pattern after 2011, because the extra water takes time to eventually deplete. Therefore, the second method eliminates the data from the years 2011-2014, since after those years the water levels stabilize again. The adjusted predictions for the years 2025, 2030, and 2050 are shown below:

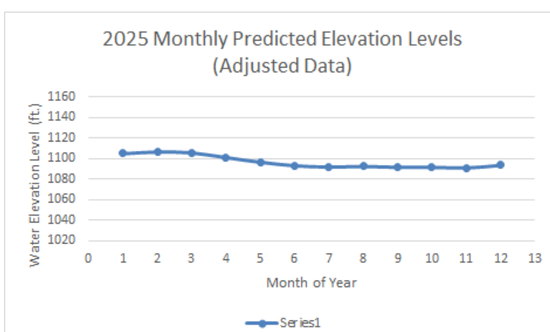


Fig. 10: In this figure, the predicted elevation of water in feet above sea level for the year 2025 starts at around 1105 in January, and then dips to 1092 in July and increases to about 1094 in December with a slight dip to 1091 in November. There is only a slight difference in this compared to the model including the large inflow of water in the year 2011, but the effects are more pronounced in the years after.

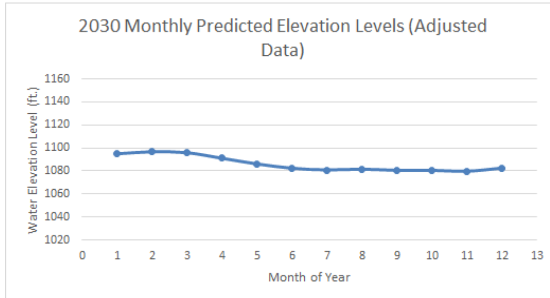


Fig. 11: In this figure, the predicted elevation of water in feet above sea level for the year 2030 starts around 1095 in January, and then dips to 1081 in July and increases to about 1082 in December with a slight dip to 1080 in November. These numbers slightly vary from the model that did not account for the large inflow of water: the water level starts higher and ends higher as well.

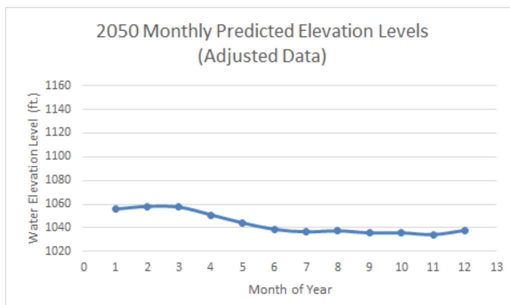


Fig. 12: This figure has the most variation in data than the model that did not account for the large inflow of water in 2011. It shows that the predicted elevation of water in feet above sea level for the year 2050 starts at around 1056 in January and dips to around 1035.62 in September, and rises up to 1038 in December with a dip to 1034 in November.

Based on this model, it is apparent that the water levels in the future will decline sharply, and the effect is most visible in the predicted values for 2050. In 2050, the predicted lowest water level is 1035.62 feet above sea level, while in 2005, the lowest water level was only 1135 feet above sea level.

Comparison

Between the two models to predict the water levels in Lake Mead for the years 2025 and 2030, the model that only factors in the most recent drought period is more robust because it considers new operating conditions and changes to regulations.

Between the two versions of our second model, the first version takes into account an abnormal inflow of water in one of the years, which allows it to be more accurate in its predictions of water levels for future years.

7. Waste-Water Recycling

While considering how waste-water recycling could be used to prevent drought and restore Lake Mead's water volume, our priority was to minimize the water needed from Lake Mead. We included the states California, Arizona, and Nevada in our plan to recycle waste-water, since these states receive the most water from Lake Mead. We considered several factors about these states: the amount of water that they received from Lake Mead, the governments of California, Arizona, and Nevada and their attitude towards the droughts at Lake Mead, these governments' efforts toward water conservation, and the cost of recycling water.

As stated before, California receives 4.4 million acre-feet of water from Lake Mead each year. California did not get a cut in their water supply in the new 2022 water regulations from the Bureau of Reclamation [3]. This indicates that California may have a stronger claim to Lake Mead's water than Arizona and Nevada, which means that they will fight any changes to their water supply harder than these other states as well. However, California is dedicated to waste-water recycling. California's governor, Gavin Newson, announced a $5.1 billion package for water infrastructure and drought response earlier this year. Within this package, $1.3 billion is for drinking water and wastewater infrastructure, with another $150 million dedicated to groundwater cleanup and water recycling projects [11]. California's government is focused on battling the effects of climate change, especially where it concerns water management.

Arizona annually receives about 2.84 million acre-feet of water from Lake Mead. However, this amount is cut by .512 million acre-feet under 2022 operating conditions. [3] Doug Ducey, Arizona's governor, is investing $30 million to protect Lake Mead this year, after the most recent drought. He states that this investment is for the future water of Arizona. The state of Arizona, in conjunction with Colorado River communities, will use these funds to keep more water in Lake Mead [12]. Arizona has demonstrated a willingness to give back to Lake Mead and help conserve its resources. This indicates that the state would be willing to join other water conservation plans.

Southern Nevada receives 0.3 million acre-feet of water from Lake Mead every year, but this number is cut by .021 million acre-feet under drought conditions. [3]. Lake Mead makes up 90% of this region's water supply and the new cut took away nearly 7 billion gallons. However, due to this region's dedication to water conservation, there has been a 23% decline in water use since 2022, despite a rapid growth in population. Nevada's water use could be reduced even further if all residents followed water usage restrictions [13]. Nevada's government is clearly very proactive in conserving and recycling water, which indicates their willingness to implement more restrictions or programs to conserve more water

All of these states show a willingness to contribute to drought reduction and change policies regarding water usage. Arizona, California and Nevada are also moving forward with a plan to save another 500,000 acre-feet of water in Lake Mead annually until 2026 [12]. However, we must also consider that it costs $1100 to produce an acre-foot of recycled water [14]. Taking these factors into consideration, our next step was to formulate a plan to recycle wastewater in California, Nevada, and Arizona.

8. Our Plan

In order to achieve an effective solution, we must persuade local leaders to invest in waste water recycling. Specifically, we need to persuade California leaders to increase their investments in waste water recycling efforts. California already recieves 4.4 million acre feet of water each year, and has senior rights to Lake Mead's water supply. As a result, California will not receive shortages from the tier one regulations. Therefore, a reduction in California's water supply, through waste water recycling, could largely benefit and increase the elevation of water in Lake Mead. California has already announced a $5.1 Billion Package for Water Infrastructure and Drought Response as a part of $100 Billion California Comeback Plan. And, $1.3 billion goes specifically towards water and waste water infrastructure. For our plan, we aim to measure the effect that this $1.3 billion dollar plan might have if it were specifically spent for wastewater recycling in California. In addition, we aim to measure the added effect that waste water recycling would have in relation to regulations in Arizona, Nevada, and New Mexico.

On the basis that it cost $1,100 to recycle an acre foot of wastewater [8] and assuming that it would cost about $10 million for the development and startup of several water treatment plants [9], we can generalize the effect that California's investment may have on reducing water intake from Lake Mead with the $1.3 billion investment. The result is 1,172,727.273 acre feet of recycled water. On the assumption this much water, almost quarter of California's water, is generated through through recycled water, this would allow California to be less reliant on Lake Mead. If California received less water from Lake Mead, it would have a greater inflow than outflow, which would allow for a annual gain of water volume. However, this goal is ambitious and would require a very large demand for funding every year, which makes it unfeasible. One alternative is utilize the benefit that renewable resources have on supplying energy to these water treatment plants to reduce costs.

A more feasible plan, however, would be to reduce droughts, through lower scale, but effective water recycling. In order to do this, we propose renewal of California's investment every four years, and we suggest the use of renewable resources to decrease cost. The result of this plan would be the elimination of water losses for one out of four years. Our plan would delay the demand for drought regulations. Therefore, we consider our plan to be an effective part of the solution to reducing the water levels of Lake Mead.

Tackling the Drought

Team #11625 | Breaking News | 2021

Background

Lake Mead is the water source for over 25 million people in America; it is the largest water reservoir in the country. In recent years, climate change is causing irreversible damage through droughts. The first water shortage on the Colorado River was declared in the summer of 2021, which resulted in reduced water deliveries to states including Arizona, Nevada, Mexico, and Nevada.

Impact

Lake Mead's water levels have been steadily decreasing over the past years, and is predicted to drop even further in the next several years. A proposed solution to bring the drop in water level back up is to recycle wastewater, but it is expensive and is a large investment.

The future

Looking at the percent changes in the water levels on a yearly basis, it is apparent that the drought is causing the water levels to drop more at a faster pace every year and getting is more severe every year. Recycling wastewater will put some of the water back into the reservoirs and lighten the severity of the droughts. Governors need to create a large budget to support this cause, and collaborate with each other to develop a plan that will save one of the most important reservoirs in America. There is already discussion and plans being made for this environmental crisis, which need to continue until Lake Mead has restored its water levels.

What YOU can do!

You already play a large role in the management of water in Lake Mead, and there is an easy way to help with the crisis: don't waste water. It's the simplest, yet most difficult part to accomplish as a consumer. When we take a long shower to relieve the stress of the day, we do not think about how people in 100 years may have to ration water. When we wash our cars repeatedly for the shine, we do not worry about whether people in 100 years will even be able to wash cars. Think about the future.

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