## Introduction

In this paper I argue that saving the Salton Sea is beneficial. The Salton Sea is a saline inland lake first created by a poorly designed irrigation system in the south of Yuma, Arizona (Ref.). Initially, the inland lake served as an attraction with added marine life, which later attracted migrating birds, making it one of their main migratory stopovers. However, as time passed the salinity of the water drastically increased because of the agricultural runoff and decreased fresh water inflows, causing several fish species to die out and affecting the surrounding environment heavily (Ref., Ref.). For certain reasons, saving the Salton Sea is a necessity for the Imperial Valley region's ecology and overall health of its residents.

I support my position with the following three arguments. First, the Salton Sea has become an important habitat for migratory birds. According to Lyons et al. (2018), the sea is an important migratory stopover for the Caspian Terns as they visit during the fall season prior and pre breeding migration. Furthermore, the presence of the sea provides these birds with better opportunities to gain energy throughout their breeding migratory route. Lyons et al. suggests that the Salton Sea has a positive impact on the population dynamics of the Caspian Terns. Second, the shrinkage of the Salton Sea will contribute to lower air quality. With an expected 38% exposure of the Salton lakebed by 2030, there is a predicted 11% increase in the particle matter of the air (Parajuli & Zender, 2018). Therefore, with the expected increase in particle matter and dust emissions, the overall air quality of the region and the health of the nearby residents will be affected. Third, the shrinkage of the sea will expose the lakebed, which contains harmful materials. According to Doede and DeGuzman (2020), the lakebed of the Salton Sea contains accumulated amounts of pesticides, herbicides, DDT, and toxaphene. With lakebed exposure, these harmful materials will spread to the neighboring residents affecting the overall public health.

I also consider alternative positions such as the price of restoration, the possibility of birds migrating somewhere else as it is a relatively new water source, and the incompatibility of the location. While these positions have merit, I refute them by, for example, suggesting

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Need to pay special attention to that

**Commented [cp2]:** And all of these will need real references by the time the next assignment comes in

**Commented [cp3]:** Certain reasons?
So
Make this a whole paragraph
Provide those reasons
Who is this Imperial Valley thing?
Explain this all as a whole paragraph
it's background

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OR
if you want more detail
Then a paragraph for each argument

that the future ecological and health losses are greater than current restoration expenses (Deode & DeGuzman, 2020) and the strategic importance of the Sea in the birds' migration routes (Lyons et al., 2018). While the location of the Sea is a great limitation, various options and alternative plans are available for the restoration of the Salton Sea, which means that the limitations can be reduced to a certain extent (Ref.).

This paper is of interest because the Salton Sea, although originating from a poorly engineered flooding accident, developed its own ecosystem over the years and currently became an important spot for endangered species of birds. Furthermore, it concerns the health of the neighboring residents. Although some people may undermine the significance of the lake, it is indefinite that further ecological and health deterioration will occur if no action was taken.

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You should be thinking about submitting it for ASRAR publication

## Discussion of Sources

### Source 1

Johnston, J. E., Razafy, M., Lugo, H., Olmedo, L., & Farzan, S. F. (2019). The disappearing Salton Sea: A critical reflection on the emerging environmental threat of disappearing saline lakes and potential impacts on children's health. *Science of The Total Environment, 663*, 804–817. https://doi.org/10.1016/j.scitotenv.2019.01.365

This article is from the journal Science of the Total Environment, which is a well-established peer reviewed scientific journal that covers environmental sciences. The main author of the article, Jill E. Johnston, received the Robert M. Zweig, M.D. Memorial Award for her efforts and research in air pollution, and so she is qualified to talk about the air quality and its effects on the Salton Sea residents. The article mainly discusses the health effects particle matter from the Salton Sea has on the nearby residents, stating that adverse health effects are viable with children being the most affected. The authors provided examples of other similar occurrences and the health effects it had on the people. Mainly, the authors are concerned that the shrinkage of the Salton Sea will increase the wind-blown dust exposure in the surrounding residential areas, which is proven to cause respiratory problems.

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Avoid prove/proved/proven

Additionally, the authors state that other health effects are viable because of the agricultural runoff matter accumulating on the lake bed that includes heavy metals and organochlorides. I will use this source to suggest that the shrinkage of the Salton Sea poses a threat on the surrounding residential areas as it increases the windblown dust that contains playa that holds potential harm on the people. I liked the explanations in this article as they provided hyperlinks for terms that may be too scientific or new to the readers. Further, they provided examples from other geographic regions that faced the same issue to provide a clear basis on the potential future of the matter in the case of further shrinkage.

**Commented [cp9]:** 13/ Verb choice: Try to avoid the verbs "state," "say," "talk about," and "mention" when referring to an author. They are overused verb and not very helpful ones. Instead, consider verbs such as argue, suggest, show, demonstrate, highlight, … but make sure you know what each of these means as they are not all just synonyms.

**Source 2**

Lyons, D. E., Patterson, A. G., Tennyson, J., Lawes, T. J., & Roby, D. D. (2018). The Salton Sea: Critical migratory stopover habitat for Caspian Terns (Hydroprogne Caspia) in the North American Pacific flyway. *Waterbirds*, *41*(2), 154–165. https://doi.org/10.1675/063.041.0206

The main author of this article, Donald E. Lyons, is the Director of Conservation Science with the National Audubon Society's Seabird Institute. he has over 20 years of experience with coastal seabirds studying their migration, breeding biology, and overall behavior. As for the journal, Waterbirds, it specializes in scientific articles regarding the conservation, biology, status, and ecology of all waterbird species. The article studies the population of the Caspian Terns that visited the Salton Sea during migratory periods to determine the overall trend and dependency on the saline lake. The results of the study showed that most of the Caspian Tern population used the Salton Sea as a stopover site for extended periods during the fall season post and prior breeding migration. Additionally, the authors hypothesized that the presence of the Salton Sea as a migratory stopover offered relatively more opportunities as it allowed the birds to recover robust nutritional states rapidly following breeding seasons. I will be using this source in my paper to emphasize on the importance of the Salton Sea for the waterbird population. As mentioned in the introduction of the paper, poor conditions of a migratory stopover directly constrain the

activities of the bird population causing potential population dynamic changes. This study will be an important piece of evidence to show the significance of the Sea's state on the waterbird populations. I liked this source because it held a thorough explanation of the methods used; however, I found it a bit hard to comprehend as it was full of statistics. The addition of maps and tables was a helpful visual aid. On a final note, the sources used were relatively old though retain credibility.

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**Source 3**

Biddle, T. A., Li, Q., Maltz, M. R., Tandel, P. N., Chakraborty, R., Yisrael, K., Drover, R., Cocker, D. R., & Lo, D. D. (2021). Salton Sea aerosol exposure in mice induces a pulmonary response distinct from allergic inflammation. *Science of The Total Environment*, *792*. https://doi.org/10.1016/j.scitotenv.2021.148450

This article is from the journal Science of the Total Environment, which is a well-established peer reviewed scientific journal that covers environmental sciences. The main author of this article, Trever A. Biddle, is a graduate student at the University of California who specializes in inflammation and immunology. As for Qi Li, one of the authors, they are postdoctoral researcher with about 7 years of experience and a PhD in organic chemistry. The authors hold credibility for conducting this study. The main discussion of this article was the effect of the Salton Sea aerosols. The authors of this article specified that the main goal was to investigate the effect of the soluble components of the Salton waters, not the particular matter, dust emissions, or lakebed exposure. To do so, they collected aerosol samples from the Salton Sea and the Pacific Ocean waters and exposed a group of mice to the samples. The results suggested that the Salton Sea's soluble components are able to result in distinct lung responses. Further, it was noted that although the Salton Sea sprays are not able to induce asthma alone, they can be key factors to the progression of asthma and other respiratory diseases. I will be using this source in my paper to discuss the harms of the untreated waters of the Salton Sea. It is important to note that the exposed lakebed and dust emissions are not the only issues, the soluble harmful irrigation material build up in the waters such as heavy

metals and DDT are problematic as well. As such, treating the water should be another concern to be discussed and solved. Something I particularly liked about this source was the authors' clarifications on the methods used and their acknowledgement of the limitations within the study, which considers that the effects on surrounding residential areas over the years is difficult to compare with consistent exposure to lungs over 7 days. Furthermore, emphasis on the control methods were provided to ensure that the study holds credibility. Finally, the language of the article included various scientific terms that would be difficult for the average reader to comprehend.

**Commented [cp11]:** 24/ Numbers: When there is one digit, use the full word spelled out (e.g., 1,2,3 …9). Otherwise, use the digits, (e.g., 10, 25, 2,367).

Auto-Peer checks for this issue

**Source 4**

Kjelland, M. E., & Swannack, T. M. (2018). Salton Sea days of future past: Modelling impacts of alternative water transfer scenarios on fish and bird population dynamics. *Ecological Informatics*, *43*, 124–145. https://doi.org/10.1016/j.ecoinf.2017.06.001

The main author of this article, Michael E. Kjelland, is a corresponding author at the U.S army Engineer Research and Development Center with 39 publications in total. The journal, Ecological Informatics, is an International Journal on computational ecology and ecological data science. The article revolves around a study that developed a model to predict the possible effects on the population dynamics of bird species of the Salton Sea. The authors explore the potential changes given two possibilities: the Quantification Settlement Agreement continues after 2017, or the Quantification Settlement Agreement (QSA) ends after 2017. The authors give a brief explanation of the QSA, which was a signed agreement between the U.S department of Interior California and the San Diego County Water Authority that decreased California's river water inflow and transferred more inflow to San Diego and other water scarce cities. The results showed an overall increase in water salinity regardless of the outcome. This trend means that the only lasting fish species will die out in upcoming years. Additionally, the authors stated that even if the fish in the lake died out, brine shrimp and brine fly will still be capable of living in the waters supporting the bird species feeding on them. However, the invertebrate population of the lake is expected to

significantly decrease by the year 2077. These results suggest a potential decrease in both fish eating and invertebrate eating bird species. I will be using this source to show the expected bird population changes if no appropriate measure was taken. Furthermore, this source will be useful to show that water levels and inflow amounts are not the only issue with the Salton Sea and water treatment will be necessary. I liked the inclusion of flow charts and graphs in the article for visual aid. Additionally, thorough explanations and descriptions of the study and the Salton Sea case were provided. The article, however, included many statistical data and equations that can be confusing for the average reader.

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**Source 5**

Parajuli, S. P., & Zender, C. S. (2018). Projected changes in dust emissions and regional air quality due to the shrinking Salton Sea. *Aeolian Research*, *33*, 82–92. https://doi.org/10.1016/j.aeolia.2018.05.004

The authors of this article, Parajuli and Zender, published 14 and 93 publications respectively. Charles S. Zender has a PhD in atmospheric physics while Sagar P. Parajuli is a research scientist at the King Abdullah university of science. The journal, Aeolian Research, is an international journal that focuses on wind erosion research. In this study, a Weather Research Forecast Model was used to simulate the dust and aerosol emission and distribution of the Salton Sea over a given period. The authors gathered data during June, which was a non-extreme month in terms of dust emissions, to estimate the relative change in dust distributions caused by the shrinkage of the Salton Sea. The results expected an overall increase in dust emissions from the southwestern region. Additionally, the particle matter is expected to increase by 11% given that 38% of the lakebed will be exposed by 2030. The study also expected an increase in the exposed playa emissions from the southeastern side relative to the southwestern side of the Sea. I will be using this source to show the indefinite increase in playa emissions resulting from the shrinkage of the lake. Furthermore, the results revealed a predicted increase in certain regions of the lake than others and that will be used to evaluate decisions to be made in the future regarding the lake. The article was very

straightforward and the methods were thoroughly explained. Something I liked would be the inclusion of the limitations and possible sources of error, such as the authors' inability to predict the sand and clay moisture. These stated limitations provide future research articles with a clear stance on what needs to be studied and further explored.

**Source 6**

Juturu, P. (2021). Assessing emergency healthcare accessibility in the Salton Sea region of Imperial County, California. *PLOS ONE*, *16*(6). https://doi.org/10.1371/journal.pone.0253301

The author of this article has 3 published works, with over 14 years of experience as a researcher in the Center for Geospatial Sciences. The journal article PLOS ONE is a peer reviewed scholarly journal, established in 2006, that covers over 200 subject areas across sciences and humanities. This article's main goal was to assess the healthcare accessibility of the Imperial County residents with special interest in the Salton Sea region. Throughout the study, the author assessed the spatial access, such as transport routes and geographic barriers, and aspatial factors, which include demographic factors. The author found that the average travel time to reach an emergency healthcare facility from the Salton Sea region was higher, with about 14 to 20 minutes more time than the average in other Imperial County tracts. As a result, the author concluded that the individual cost for accessing emergency healthcare centers for asthma patients of the Salton Sea region is higher. This expectancy for higher expenses poses a problem as about 21.4% of the Salton Sea residents live below the poverty line. I will be using this source to discuss the state of the surrounding residents and their already impoverished situation. As the shrinkage of the Salton Sea increases, there will also be an expected rise in asthma attacks and pulmonary diseases. With and already weak healthcare support for the Salton Sea residents, more negative outcomes are yet to unfold. Overall, the language of this source is easy for an average reader to comprehend. I felt like more data could be used as only two hospitals were studied in this paper. Additionally, I did

not like how the author kept talking about how unique and special their article is multiple times.

**Source 7**

Doede, A. L., & DeGuzman, P. B. (2020). The disappearing lake: A historical analysis of drought and the Salton Sea in the context of the GeoHealth framework. *GeoHealth*, *4*(9). https://doi.org/10.1029/2020gh000271

The authors of this article, Doede and DeGuzman, published 6 and 43 works respectively. Aubrey L. Doede is a Postdoctoral Fellow specializing in Cardiovascular Disease Epidemiology, while Pamela B. DeGuzman is an associate professor in the University of Virginia School of Nursing. The journal article GeoHealth publishes high quality research articles conjoining environmental sciences, Earth, and health sciences. In this article, the authors make parallel comparisons between the Aral Sea and the Salton Sea. The Aral Sea is a terminal lake situated between the borders of Uzbekistan and Kazakhstan that eventually dried up and resulted in mass losses both environmental and health related. In the case of the Aral Sea, acute diversions from its two main feeding rivers for irrigation purposes caused severe decreases in the water levels and an increase in the saline levels. As a result, the lake rapidly evaporated exposing large amounts of the lakebed. Additionally, notable amounts of chemicals and pesticides such as DDT and toxaphene made their way to the lake as a result of the spike in agricultural activity during the post WWII era. With mass evaporations and water loss, the chemicals accumulated were exposed and distributed over the surrounding parameters through wind making their way into the surrounding air, water, and food pathways. Medical reports state that the Aral Sea region has relatively higher rates of cancer, hepatic and renal diseases, pregnancy complications, infant mortality, and respiratory diseases. The Salton Sea shares many characteristics with the Aral Sea case and so similar health hazards and ecological deterioration are expected. I will be using this source to discuss the adverse health effects that would result if the Salton Sea was left untouched. Furthermore, this article suggests that the future health effects could prove expensive and

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difficult for the impoverished population of the Salton Sea region to deal with. I liked this source because the authors were thorough with their comparisons between both seas and provided detailed descriptions of the history, similarities, and differences of both cases. The language used is relatively easy for an average reader to comprehend.

**Source 8**

Levers, L., Story, S. D., & Schwabe, K. (2020). Boons or boondoggles: An assessment of the Salton Sea water importation options. *California Agriculture*, *74*(2), 73–79. https://doi.org/10.3733/ca.2020a0009

The main author of this article, Lucia Levers, has a Ph.D. in environmental sciences with 7 published journal articles. As for the author Drew S. Story, he has a PhD in chemical and environmental engineering. He is also the Water Cycle Science Lead of the National Coordination Office. These qualifications show the authors' credibility. In this article, the authors evaluate the expenses of two suggested solutions, which are ocean water transfers and agriculture-to-environment water transfers. The authors mainly assess the costs of both water transfer options; however, they mention that it is important to account for political and environmental aspects as well. For the ocean water transfer option, the authors found that it would be relatively cheaper to transfer water from the Cortés Sea than from the Pacific Ocean. This water transfer, however, will need internationally agreements as it involves crossing international borders. As for the agriculture-to-environment water transfer option, leasing agricultural water from nearby farmers was found to be the cheapest and most efficient way. When compared to one another, the ocean water transfer option is cheaper though it will require more time and the environmental impacts on the Cortés Sea should be accounted for. Agriculture-to-environment water transfer, although more expensive, is a better short run solution as it requires less time and infrastructural efforts. I will be using this source in my paper to propose possible solutions and provide a thorough analysis of their alternatives, their advantages, and their disadvantages. This article used relatively easy

**Commented [cp14]:** Note how it's written

**Commented [cp15]:** Yes, like this

**Commented [cp16]:** Not like this

language. Additionally, thorough explanation of the cost derivations was provided both in text and in table forms to make it easier for the readers to follow.

**Outline**

- Introduction:
    - Thesis and definition
        - saving the Salton Sea is beneficial
    - Reasons why I support this position, include brief explanation of the support argument
        - it holds significant ecological value for the wildlife within the region
        - its shrinkage will severely affect the region's air quality
        - exposure of the lakebed will result in worse health conditions for the surrounding residents
    - Problems, issues, and alternative views associated with the thesis, include brief explanation on counter argument and its refutation
        - price of restoration
        - situated in arid environment with low precipitation because of climate change
        - Avian species depending on the Sea can find alternative migratory stopovers
    - Importance and conclusion
        - concern on the public health of the surrounding residents
- Background:
    - General knowledge on Salton Sea history and origin
    - health effects on neighboring residents in similar geographic locations
    - the rate of decrease in water level and increase in lakebed exposure
- Main Argument:
    - Argument 1: Decrease in quality of the surrounding air with increase in shrinkage
        - increase in particle matter and dust emissions

- increase in number and intensity of asthma cases
- increase in other respiratory diseases

o Argument 2: various bird species' dependence on the Salton Sea

- Important migratory stopover
- home to some resident bird species

o Argument 3: Chemical accumulation and agricultural runoff material harmful for the people upon exposure

- lakebed contains pesticide, herbicide, and DDT buildup
- can cause various health problems such as cancer, pregnancy complications, and infant mortality

• Counter Argument:

o Counter argument 1: location limitation

- no natural source of water inflow
- Climate change
- arid region

o Counter argument 2: high price for restoration

- possible solutions require high expenses

o Counter argument 3: Bird species depending on it can look for an alternative water body

- Salton Sea is relatively new

• Refutation on the counter arguments:

o Counter argument 1: location limitation

- Civil engineers' (specifically water resource engineer) and chemical engineers' solutions to treat and transport water.

o Counter argument 2: price of restoration

- future ecological losses are more expensive
- future health expenses are more expensive

- Counter argument 3: Bird species depending on it can find an alternative water body
  - Salton Sea proved to have positive effects on bird population dynamics
  - Location of Salton Sea is strategic for migratory birds

• Conclusion

- Restate the thesis (long thesis/ thesis statement)
  - Saving the Salton Sea is beneficial as it prevents further economic, ecological, and health losses.
- Summarize main arguments
  - Supporting arguments
  - Counter arguments
  - Rebuttal of counter arguments
- Suggestions
  - fast action towards the Salton Sea case

**References**

Biddle, T. A., Li, Q., Maltz, M. R., Tandel, P. N., Chakraborty, R., Yisrael, K., Drover, R., Cocker, D. R., & Lo, D. D. (2021). Salton Sea aerosol exposure in mice induces a pulmonary response distinct from allergic inflammation. *Science of The Total Environment*, *792*. https://doi.org/10.1016/j.scitotenv.2021.148450

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**Commented [cp17]:** An excellent proposal
Take careful note of all the comments though "Repairing the introduction" (next assignment) won't be too much of an ask – but getting those references right is important.

YOU … can write! ☺

Juturu, P. (2021). Assessing emergency healthcare accessibility in the Salton Sea region of Imperial County, California. *PLOS ONE*, *16*(6). https://doi.org/10.1371/journal.pone.0253301

Kjelland, M. E., & Swannack, T. M. (2018). Salton Sea days of future past: Modelling impacts of alternative water transfer scenarios on fish and bird population dynamics. *Ecological Informatics*, *43*, 124–145. https://doi.org/10.1016/j.ecoinf.2017.06.001

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Parajuli, S. P., & Zender, C. S. (2018). Projected changes in dust emissions and regional air quality due to the shrinking Salton Sea. *Aeolian Research*, *33*, 82–92. https://doi.org/10.1016/j.aeolia.2018.05.004