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**THE VANISHING GREAT SALT LAKE,  
1985–2022**

## BACKGROUND

- ▶ Researchers say the Great Salt Lake in Utah is on track to disappear in five years
- ▶ Water from the rivers that feed the lake is diverted for agricultural and municipal purposes, leading to a shortfall of nearly 400 billion gallons a year
- ▶ Climate change is exacerbating this because the rivers have less water now
- ▶ Other lakes have disappeared for similar reasons in the past, e.g., the Aral Sea
  - ▶ Pollutants that were underwater are now airborne, causing respiratory diseases and cancer
  - ▶ Salt deposition has led to crop destruction
  - ▶ Livelihoods and cultural identity have been destroyed
- ▶ Does a similar fate await the Great Salt Lake?

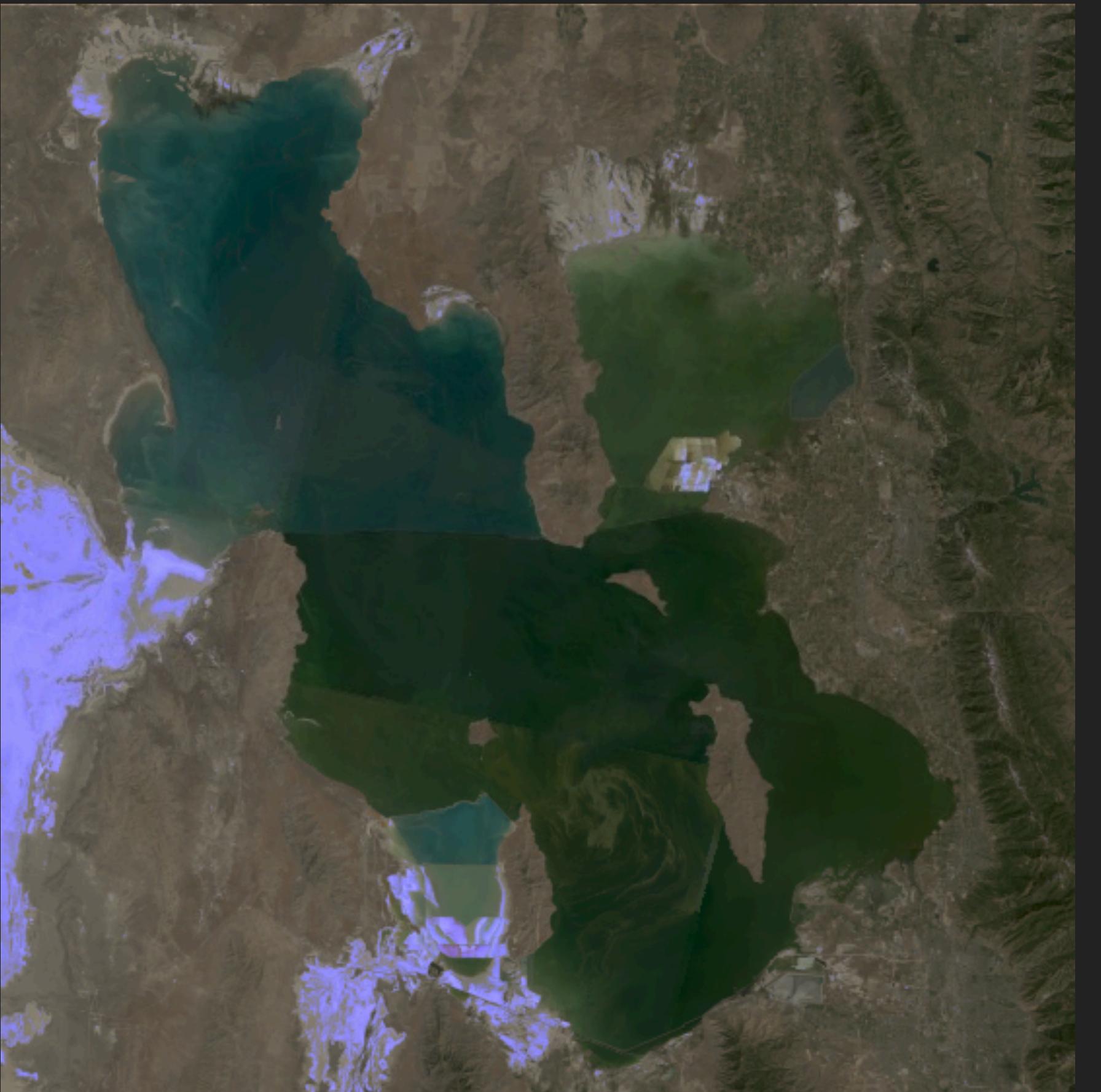
## SCOPE OF THE STUDY

- ▶ The lake was at its highest extent in the mid 1980s and is at historic lows now, so Landsat 5 and 9 images from 1985 and 2022 were used
- ▶ Three image representations were made from each year:
  - ▶ RGB (true color)
  - ▶ NIR, Red, Green (for vegetation, which shows up as red)
  - ▶ SWIR, NIR, Green (for higher contrast and more vivid vegetation)
- ▶ Supervised classification was conducted using the Random Forest algorithm to identify six land cover classes and calculate their areas in 1985 and 2022
- ▶ All accuracy and kappa statistics were >95% indicating high reliability

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## RED, BLUE, GREEN TRUE-COLOR



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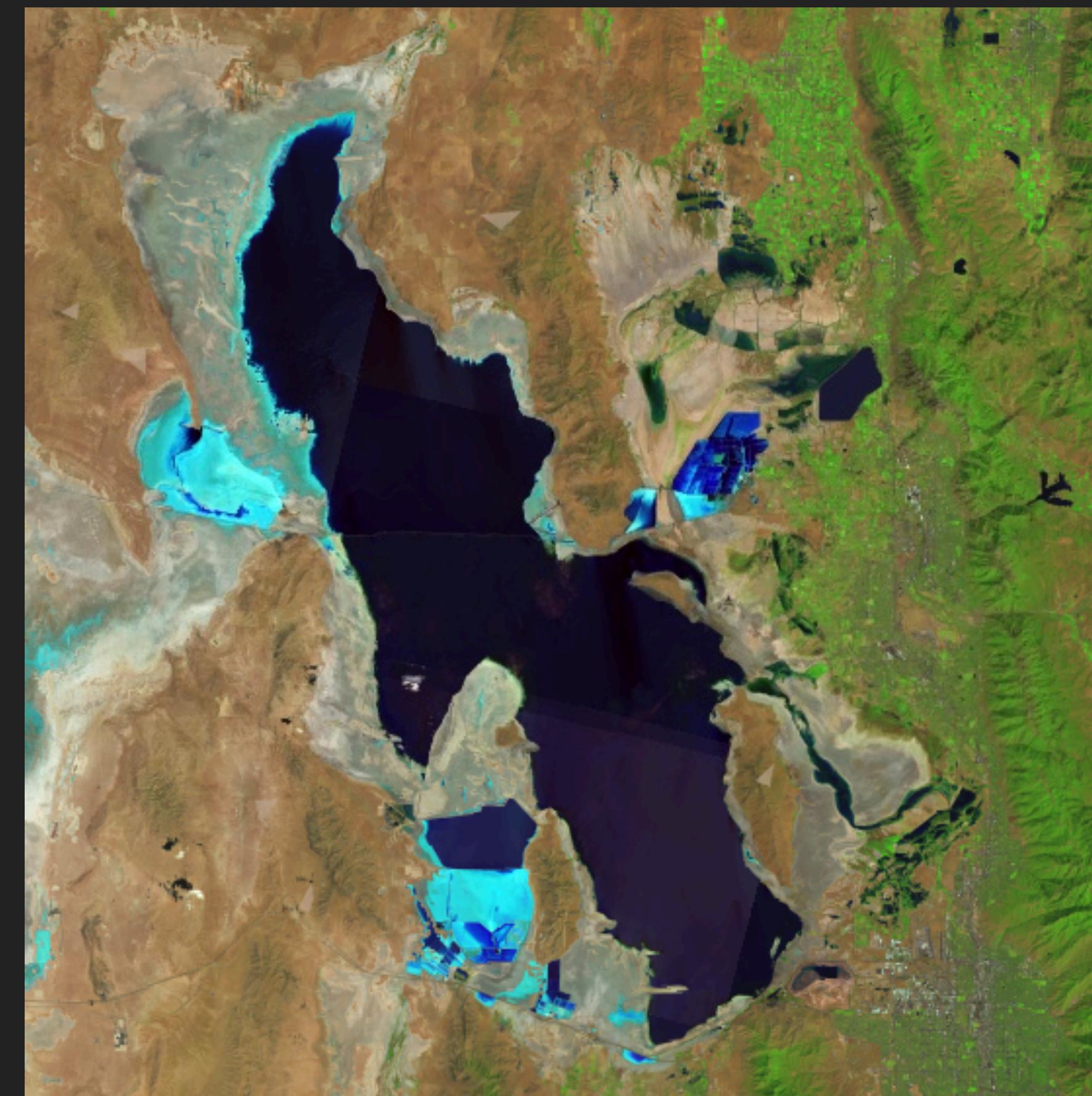
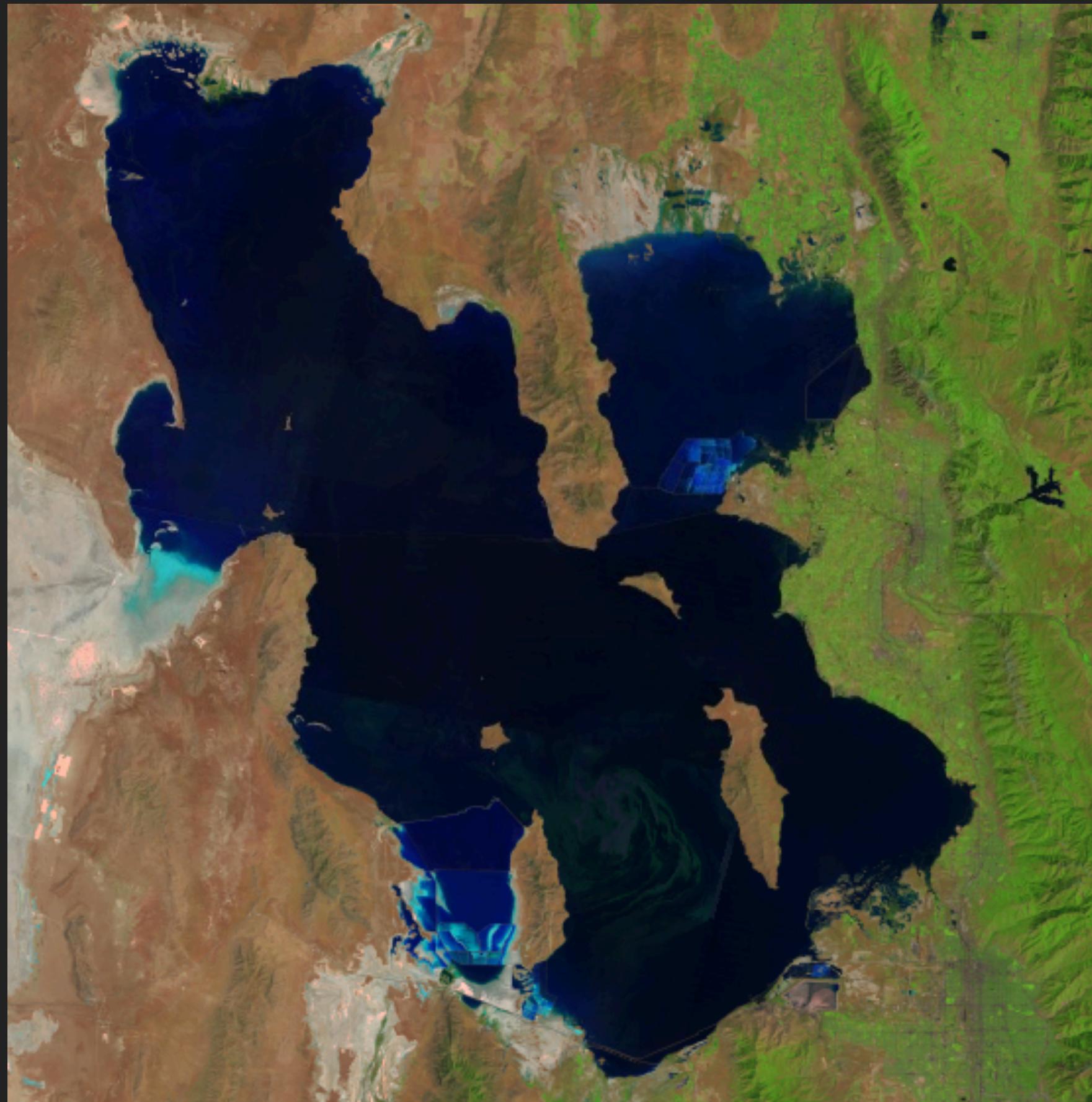
## NEAR INFRARED, RED, GREEN FALSE-COLOR



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## SHORTWAVE INFRARED, NEAR INFRARED, GREEN FALSE COLOR



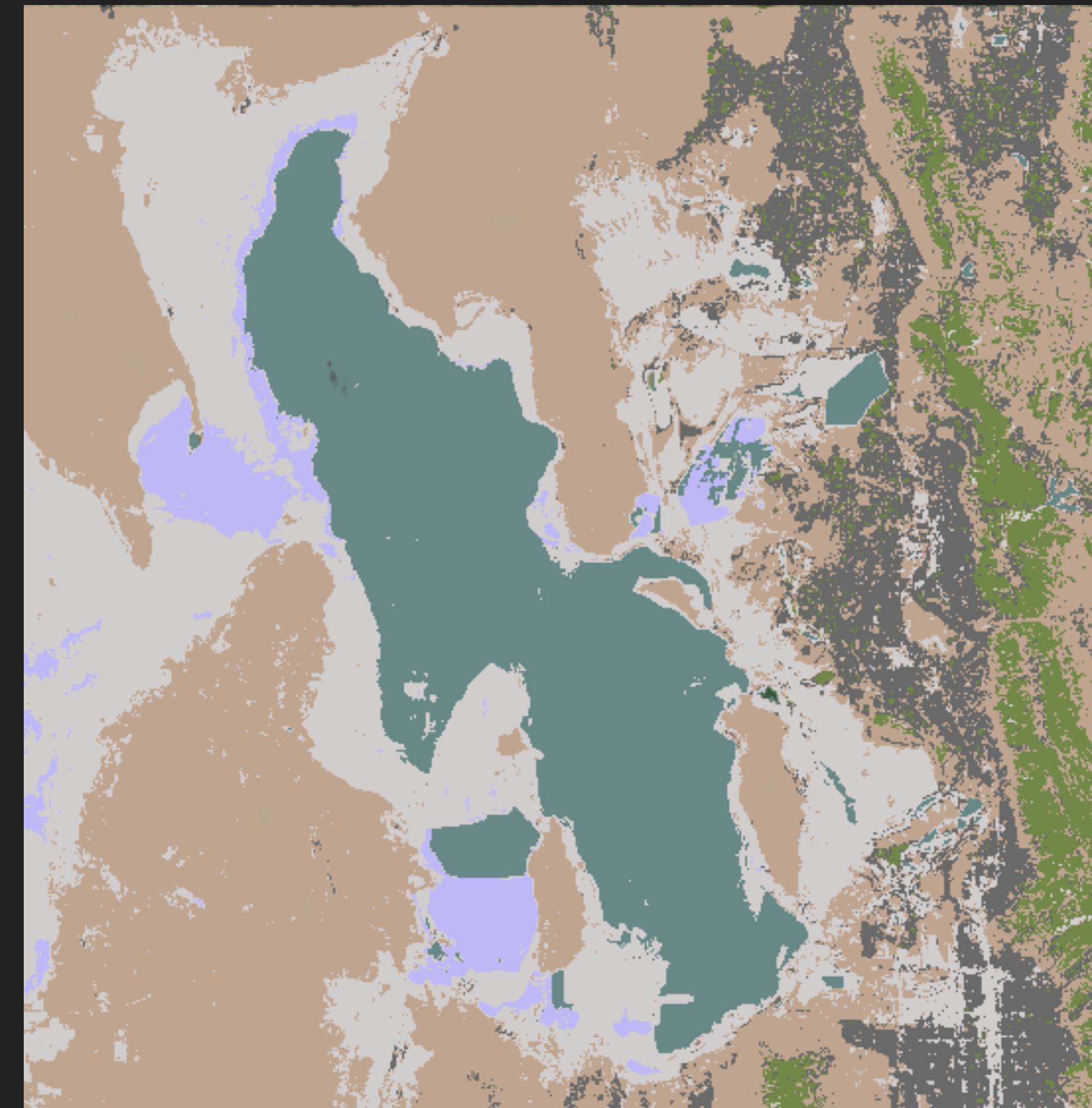
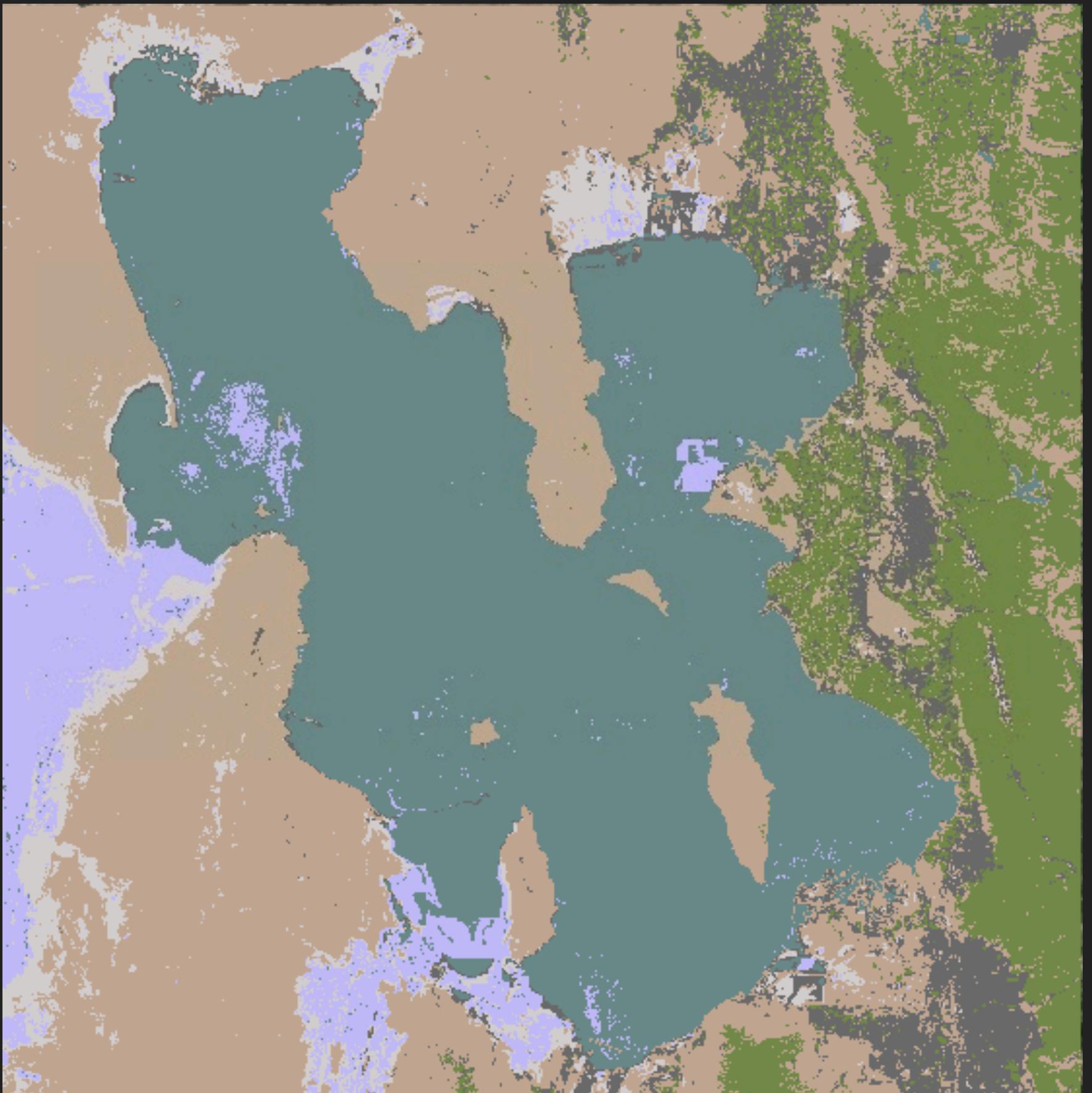
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# RANDOM FOREST CLASSIFICATION

## Great Salt Lake Land Cover

Supervised Classification

- Water
- Vegetation
- Bare Soil
- Dry Lake Bed
- Urban
- Salt Pans or Deposits



## LAND CLASSES AND PERCENT CHANGE BASED ON RF CLASSIFICATION

- ▶ All figures in km<sup>2</sup>

Feature Class	1985	2022	Percent Change
Water	5781	2535	-56%
Vegetation and Agriculture	2240	1017	-55%
Bare Soil	5778	6889	16%
Dry Lake Bed	873	4079	79%
Urban Development	986	1435	31%
Salt Deposits or Pans	829	529	-56%

## LIMITATIONS AND CONCLUSIONS

- ▶ RF Classification could not distinguish salt pans from salt marshes
- ▶ All water, including a freshwater reservoir, is calculated as part of the lake surface, so the study underestimates the true extent of shrinking (which is 60% rather than 56%)
- ▶ Bare soil and vegetation were not well distinguished in the 1985 image
- ▶ Mosaicking artifacts are undesirable
- ▶ But despite these shortcomings, the study clearly shows that the Great Salt Lake is in grave danger