

JORDAN RIVER BACKGROUND

Principal Sources

Hasbani River - Lebanon

Baniyas River - Syria

Dan River - Mount Hermon



Physical Characteristics

- Lowest elevation of any river in the world
- More than 223 miles in length, actual distance between source and the Dead Sea is 124 miles
- Shallow but the current is swift and carries silt
- Thermal springs near Sea of Galilee give water a high degree of salinity

WATER ANALYSIS

Parameters and Procedure:

- pH → pH meter
- Total Suspended Solids → mass reading and turbidity
- Total Dissolved Solids → mass reading (gravimetric analysis) and conductivity
- Conductivity → multimeter
- Turbidity → nephelometer
- Ammonium → indicator and colorimeter
- Coliforms → filtration, incubation, counting

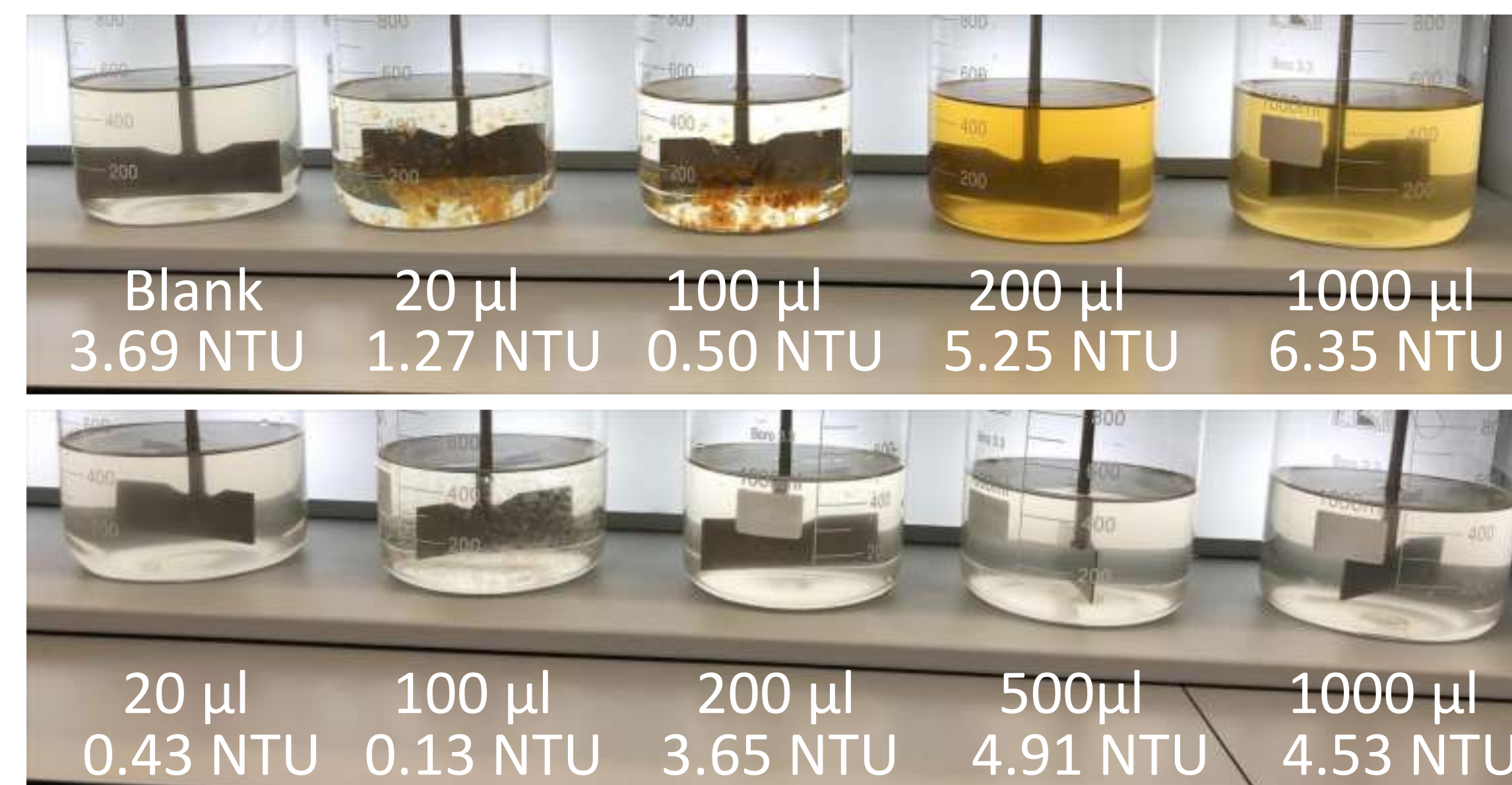
Pre-treatment Findings:

Parameter	Measured Value	Regulated Maximum
pH	9.04	N/A
Total Suspended Solids	0.0058 g (200 mL filtered)	N/A
Total Dissolved Solids	77.4 ppm	100-200 mg/L
Conductivity	183.2 μ S	200-300 μ S
Turbidity	2.9 NTU	0.5 NTU
Ammonium	<1	N/A
Coliforms	0	0

REFERENCES

- "Biblical Waters: Can the Jordan River Be Saved?" *National Geographic*, National Geographic Society, 27 July 2016, [news.nationalgeographic.com/news/2016/07/27/140222-jordan-river-syrian-refugees-water-environment/](https://www.nationalgeographic.com/news/2016/07/27/140222-jordan-river-syrian-refugees-water-environment/).
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WATER SAMPLE TREATMENT



Coagulation

- Using PAC & Ferric Chloric Acid with a 17.5 & 35 weight percentage.
- Stirred for 15 seconds at 120 RPM

Flocculation

- Stirred for 15 minutes at 15 RPM

Settling

- Settled at zero RPM for 15 minutes

Turbidity

- Found that PAC at 100 µl was the most effective treatment concentration to acquire a turbidity reading of 0.13 NTU

Coliforms

- No coliforms were found in our water sample

TRIP TO ISRAEL

Few places represent the depth of ancient history and breadth of modern discovery quite like Israel. Much like the photo below, we see the ruins of Caesarea mere miles from symbols of innovation like the Hadera desalination plant. However, one thing remains constant throughout history: the desperate cry for water. The famous Roman aqueduct approaches the backdrop of seawater intake pipelines, reflecting the ongoing effort to supply water to the desert.



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CURRENT TREATMENT IN ISRAEL

Two Major Issues:

- *Highly politicized* - Religion and Regional Projects
 - National Water Carrier
 - Headwater Diversion Plan
 - Jordan Valley Unified Water Plan

- *Heavily Polluted* - Turbidity, Waste and Salt

Currently, the main treatment efforts go toward rehabilitation and "recharging the river"

- Prevention of raw sewage flow
- Provision of desalinated brackish water and treated wastewater for regional agriculture
 - Wastewater effluent
 - At first, only purifying sewage at a primary (coagulation, flocculation, settling, etc.) and secondary level (biological -- activated sludge)
 - Operating at a tertiary level in January 2016 (additional clarifying processes)
 - Brackish water
 - Desalination (reverse osmosis)



COLORADO RIVER TREATMENT



Potential Uses

This water source is already crucial to California & its surrounding states. In Arizona and California, the water is used for irrigation and domestic uses. In Nevada, the water is solely used for domestic purposes.

Proposed Treatment Train

Every state has its own treatment train depending on where the river is located and the contaminants affecting that area. The most common treatment train is as follows:

1. Screening
2. Coagulation & Flocculation
3. Gravity Filtration through multiple mediums
 - a. Sand, gravel, and carbon
4. Chlorine Disinfection
 - a. Leaves a residue that allows for verification that the water will stay clean through the transportation process.