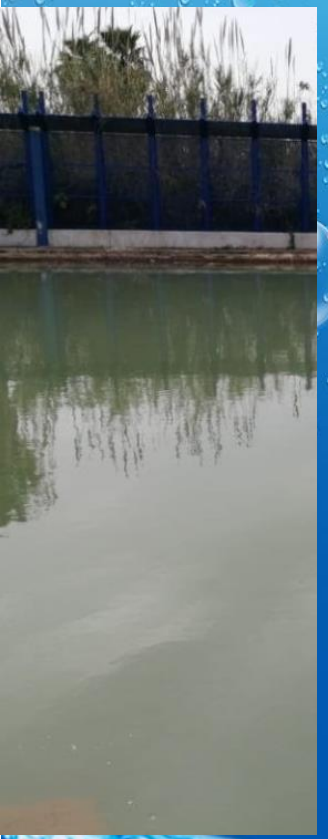
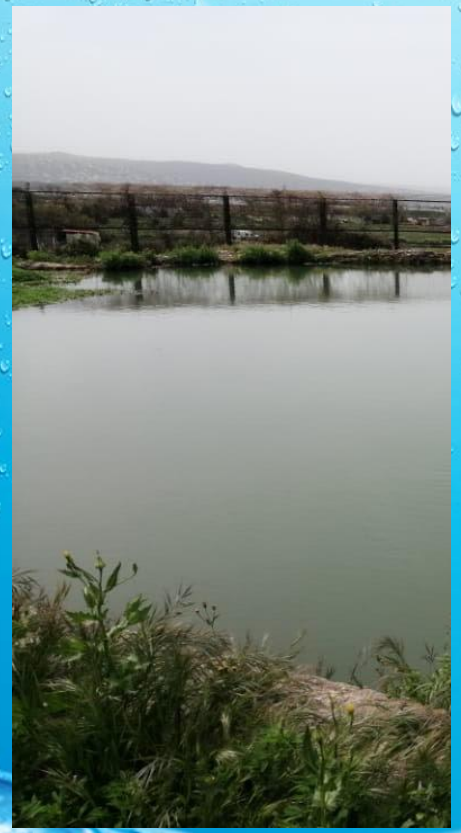
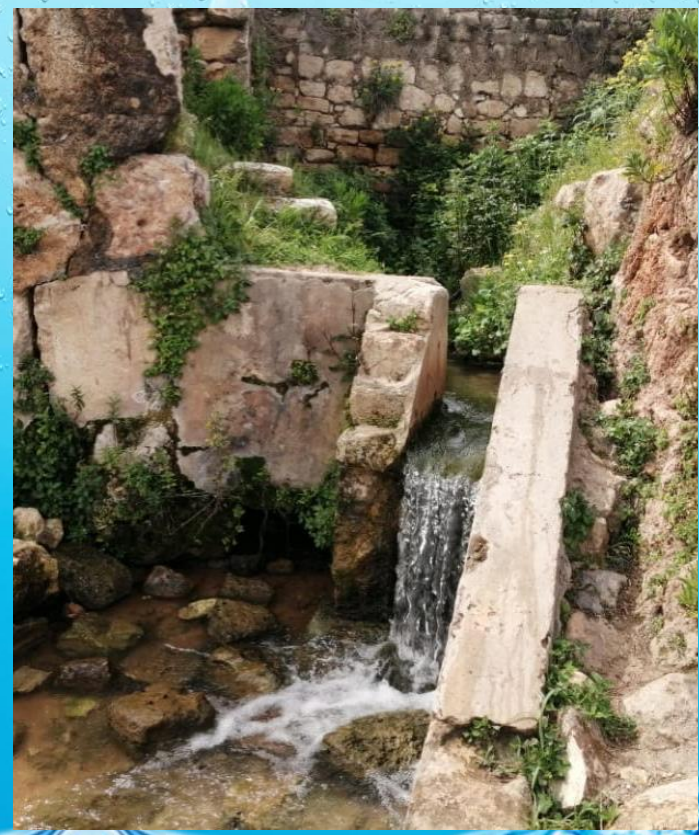
2022 The 5th International Symposium on Water Pollution and Treatment

ISWPT 2022
October 28 -29, 2022 Bangkok



Physicochemical and microbiological characteristics of Ras El-Ain basin, Tyre, Lebanon





Oct. 28-29, 2022 | Webinar

Physicochemical and microbiological characteristics of Ras El-Ain basin, Tyre, Lebanon

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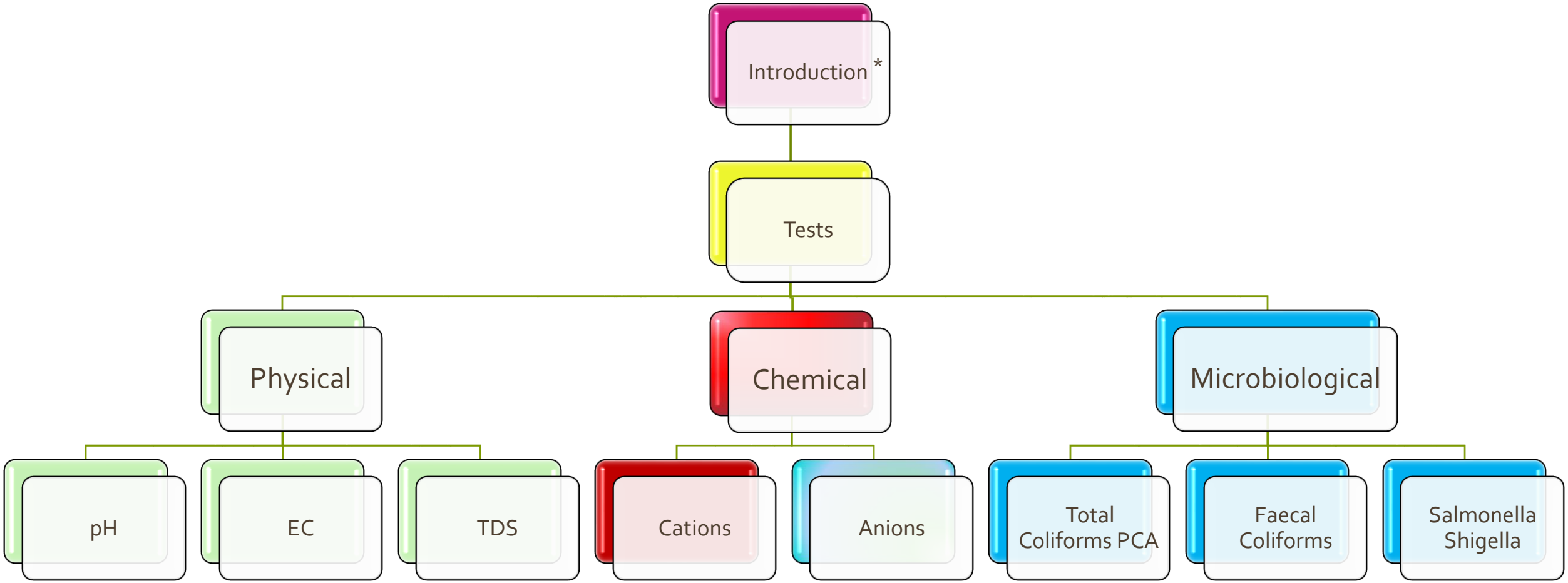


Summary

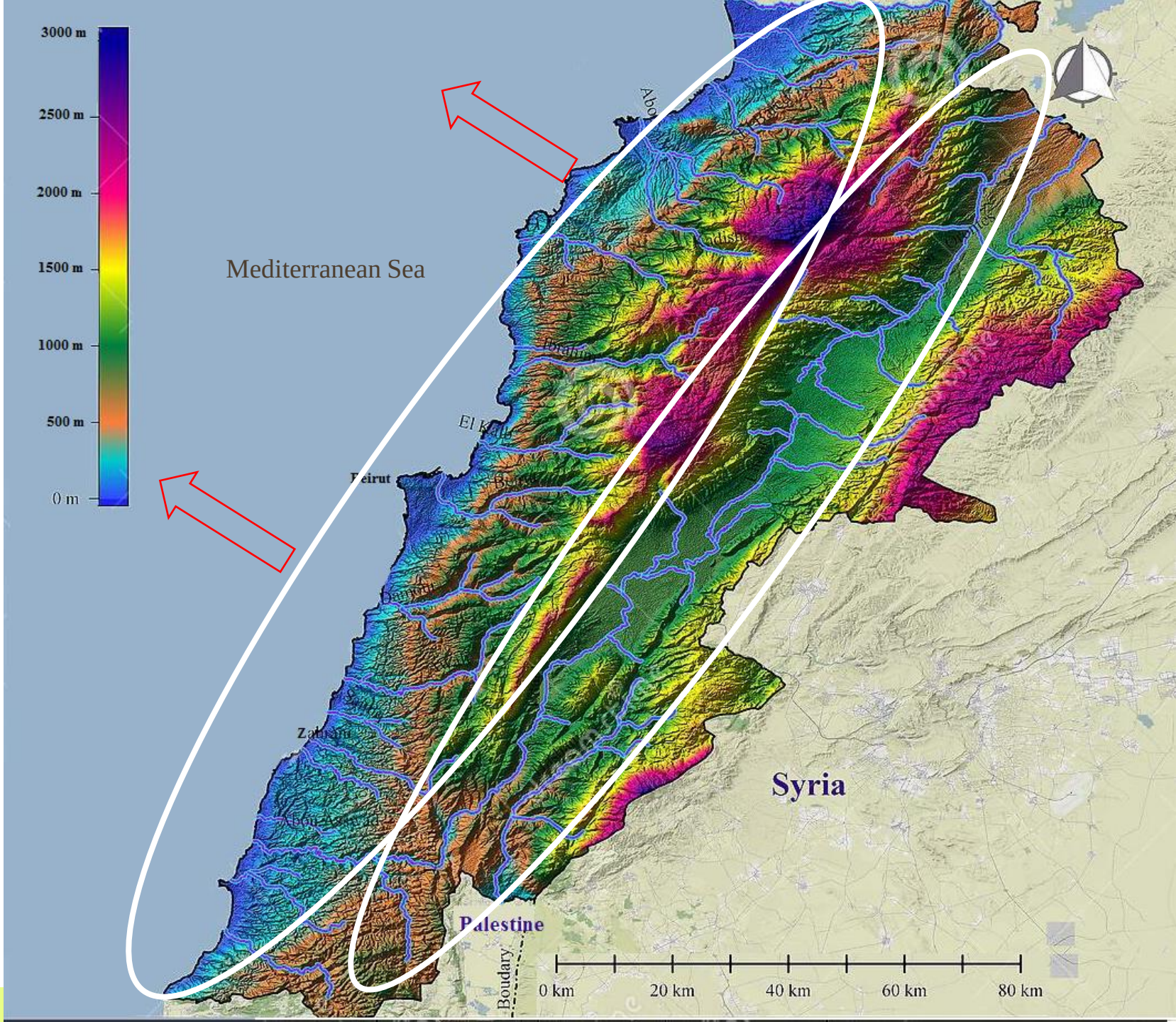
Discussions

Recommendations

* Ras El-Ain Basin 1714

Introduction

- All Lebanon rivers are non navigable.
- 28 begin on the western slope of the Lebanon range and flow via steep gorges into the Mediterranean Sea.
- Besides that, there are six rivers originate in the Beqaa Valley.



Abou Ali River

Beirut River

Lebanon's natural water resources are facing serious problems and approach from Exhaustion*

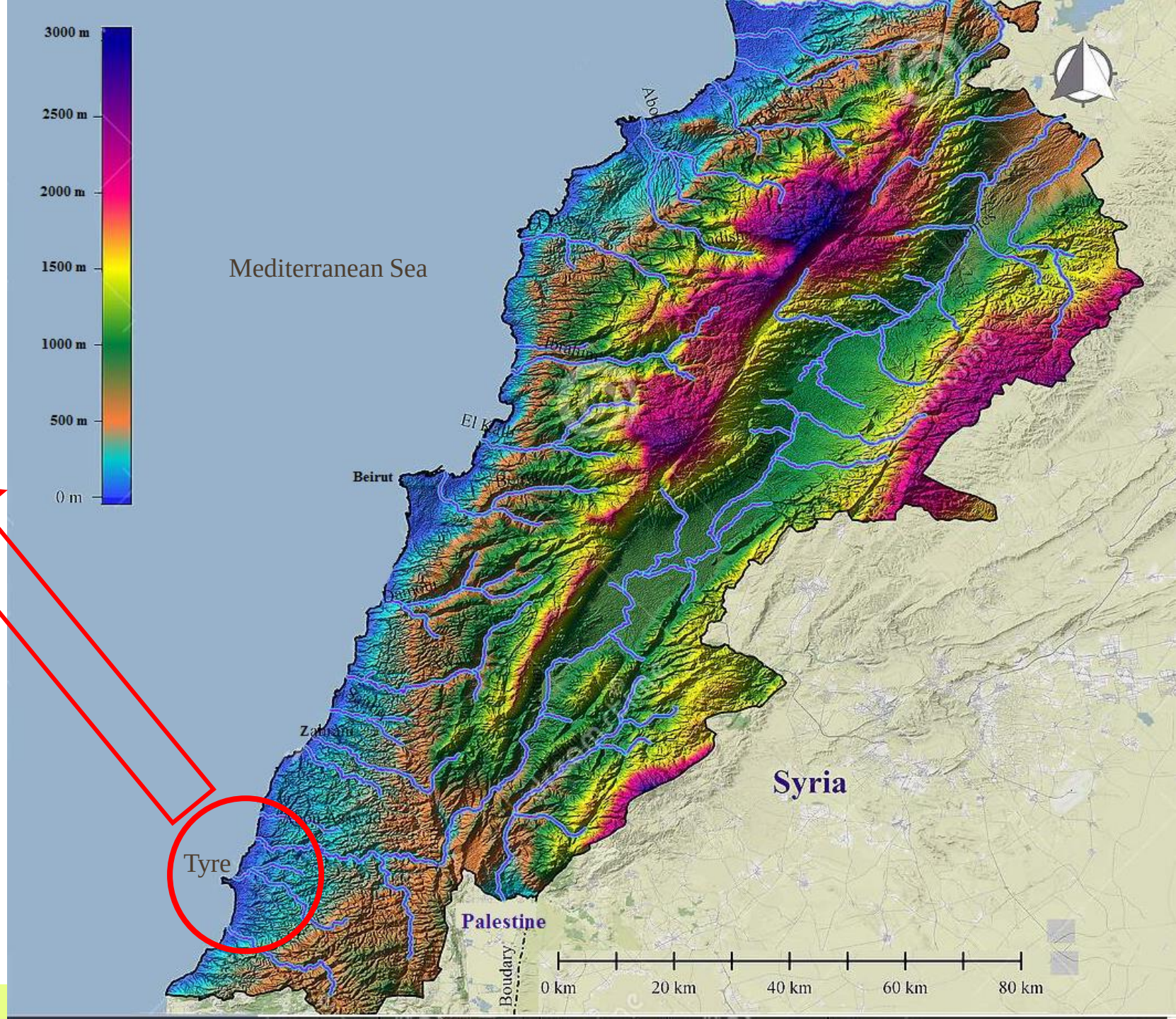
Ibrahim River

Awali River

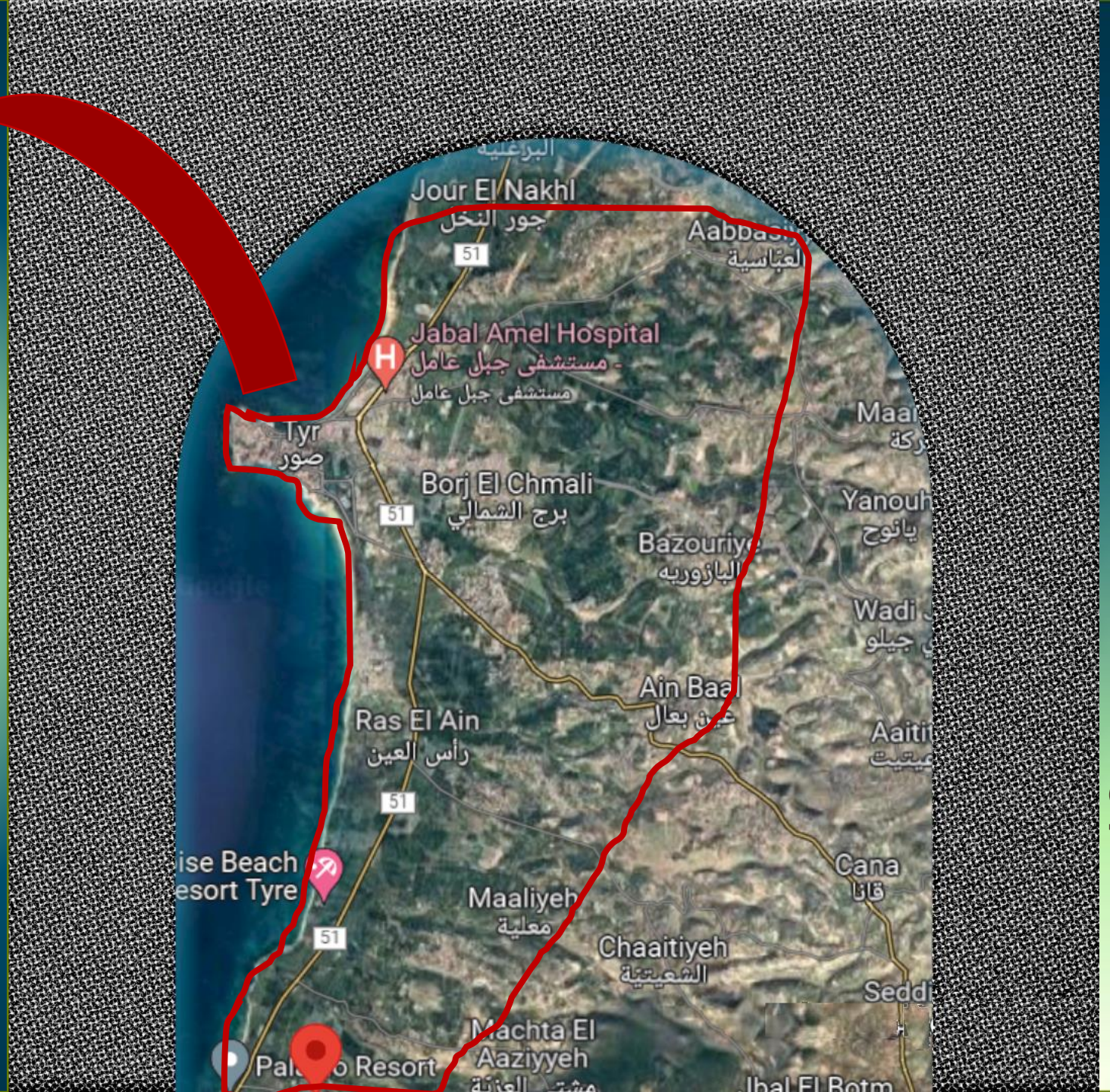
Lebanon's natural water resources are facing serious problems and approach from Exhaustion*

Lebanon's natural water resources are facing serious problems and approach from Exhaustion*

- The Ras El-Ain basin is 6 km far south of Tyre, Lebanon.*



over
30 km square.



The Lebanese state dedicated it, along with other reservoirs, to supply potable water for:

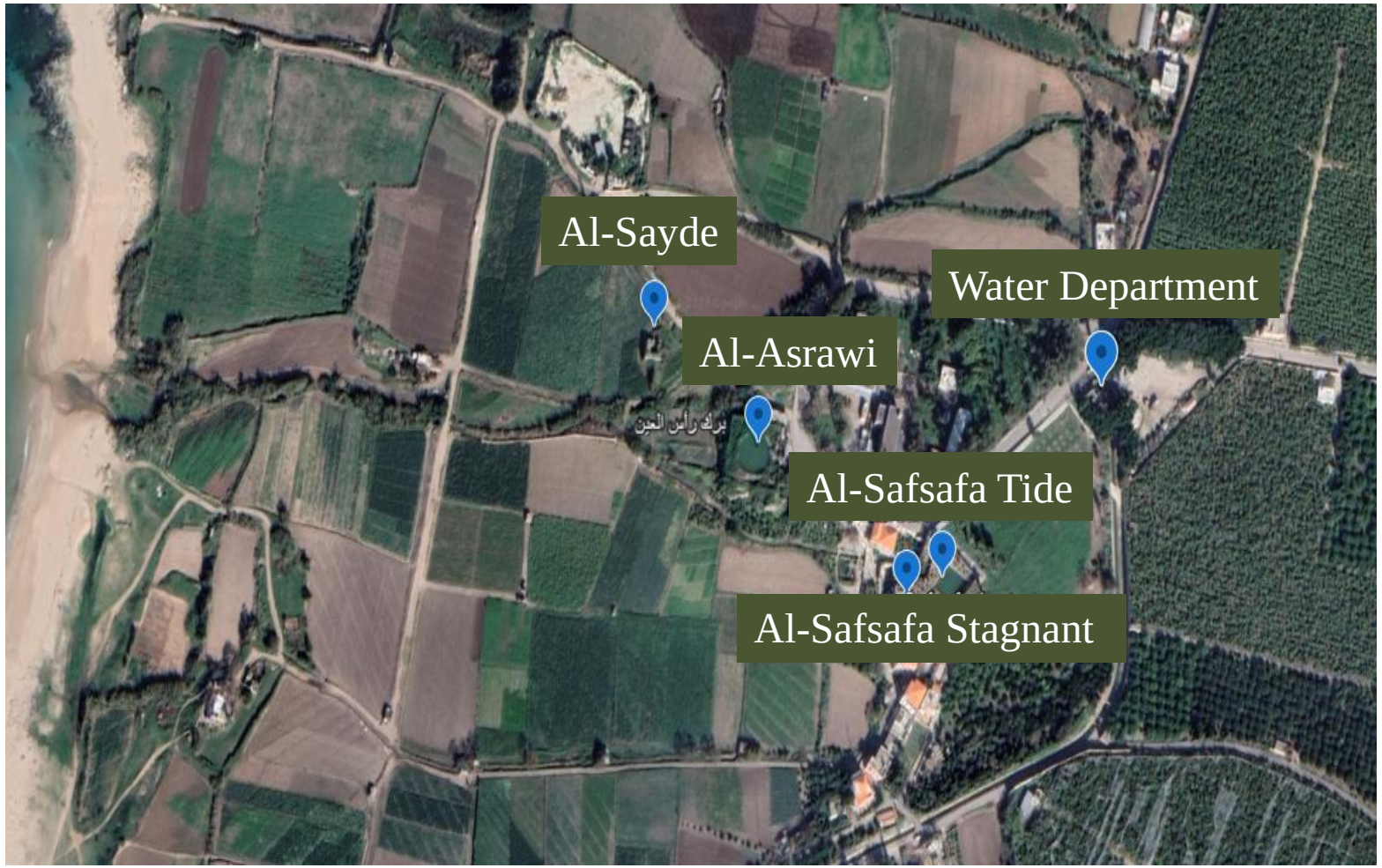
Tyr
&
Surrounding villages.

Observations

These basins' water quality has deteriorated significantly.

Contamination can be seen through direct observations, odors, watercolor, and patterns.

Ras El-Ain Basin Location



Different selected samples from each basin were tested.

Name	Designation
Al-Safsafa Stagnant	SF1
Al-Safsafa Tide	SF2
Al-Sayde	SD
Al-Asrawi	SA
Water Department	MS

To assess the level of pollution in the Ras El-Ain basin “physicochemical and microbiological”

Physical Tests

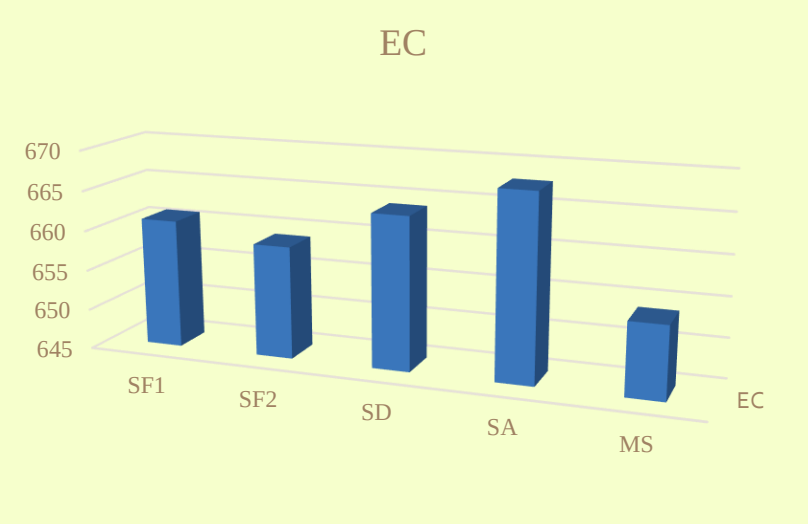
Microprocessor pH	Tracer EC/TDS	
To test the degree of acidity or alkalinity for the water	To measure the water's capacity into carrying Electric Current	To measure the Total Dissolved matter in the water

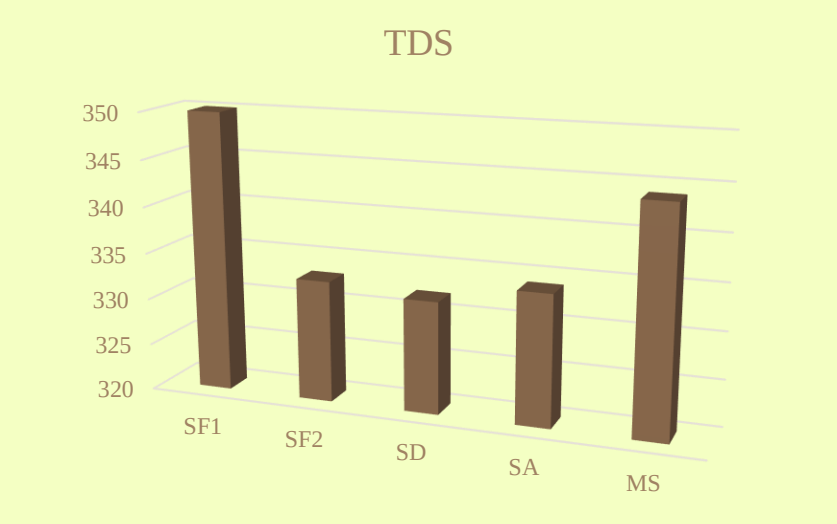
Physical Tests

Microprocessor pH

Tracer EC/TDS

Physical Tests





LIBNOR (Lebanese Standard Institution) specifications

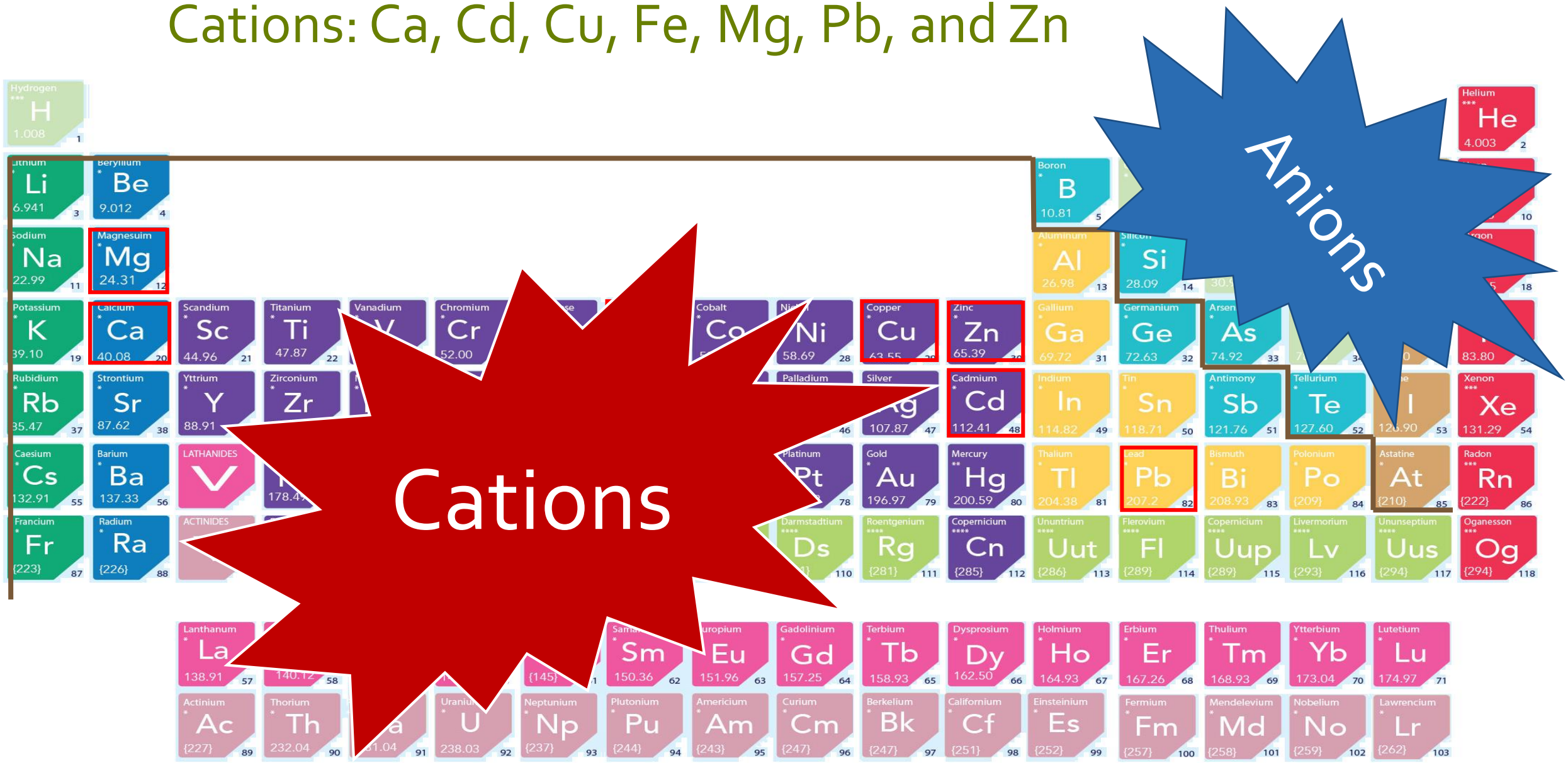
6.5 < pH < 8.5

EC < 1500µS/cm

< 500mg/L

Chemical Tests

Cations: Ca, Cd, Cu, Fe, Mg, Pb, and Zn



Flame Atomic Absorption (FAAS)

Cadmium

Non Detected

< 0.005mg/L

Lead

Non Detected

< 0.1mg/L

Flame Atomic Absorption (FAAS)

It is a popular method for identifying metals in natural materials. This principle is based on measuring the intensity of emitted light when metal is put into the flame. The wavelengths of the color indicate the element, and the color of the flame represents the amount of the contained item.

Cadmium

Non Detected

< 0.005mg/L

Lead

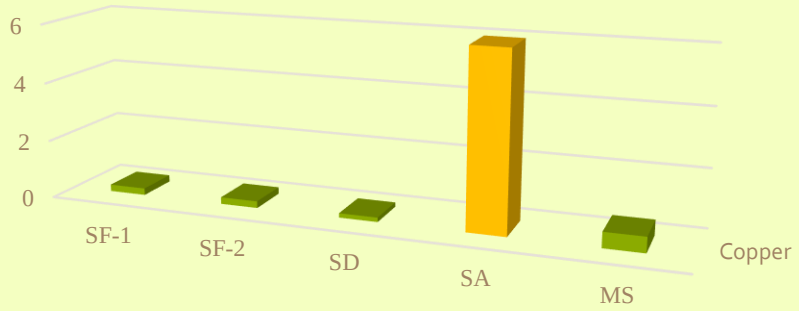
Non Detected

< 0.1mg/L

Calcium

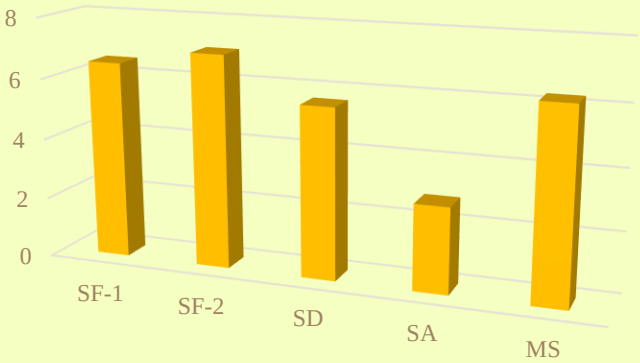
< 200mg/L

Copper



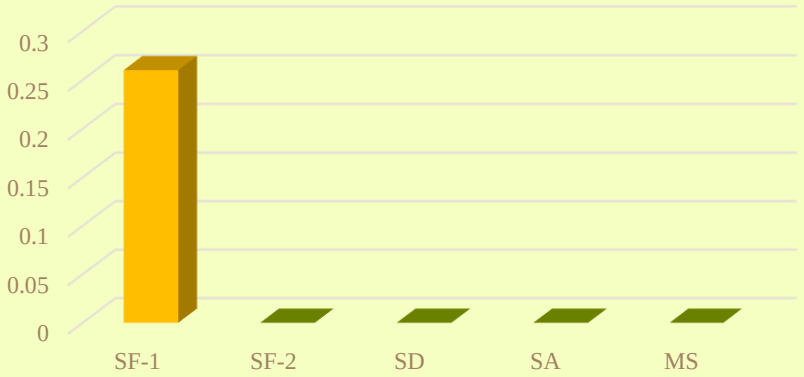
< 1mg/L *

Iron



< 0.3mg/L

Lead



< 0.1mg/L

Magnesium

< 50mg/L

Zinc

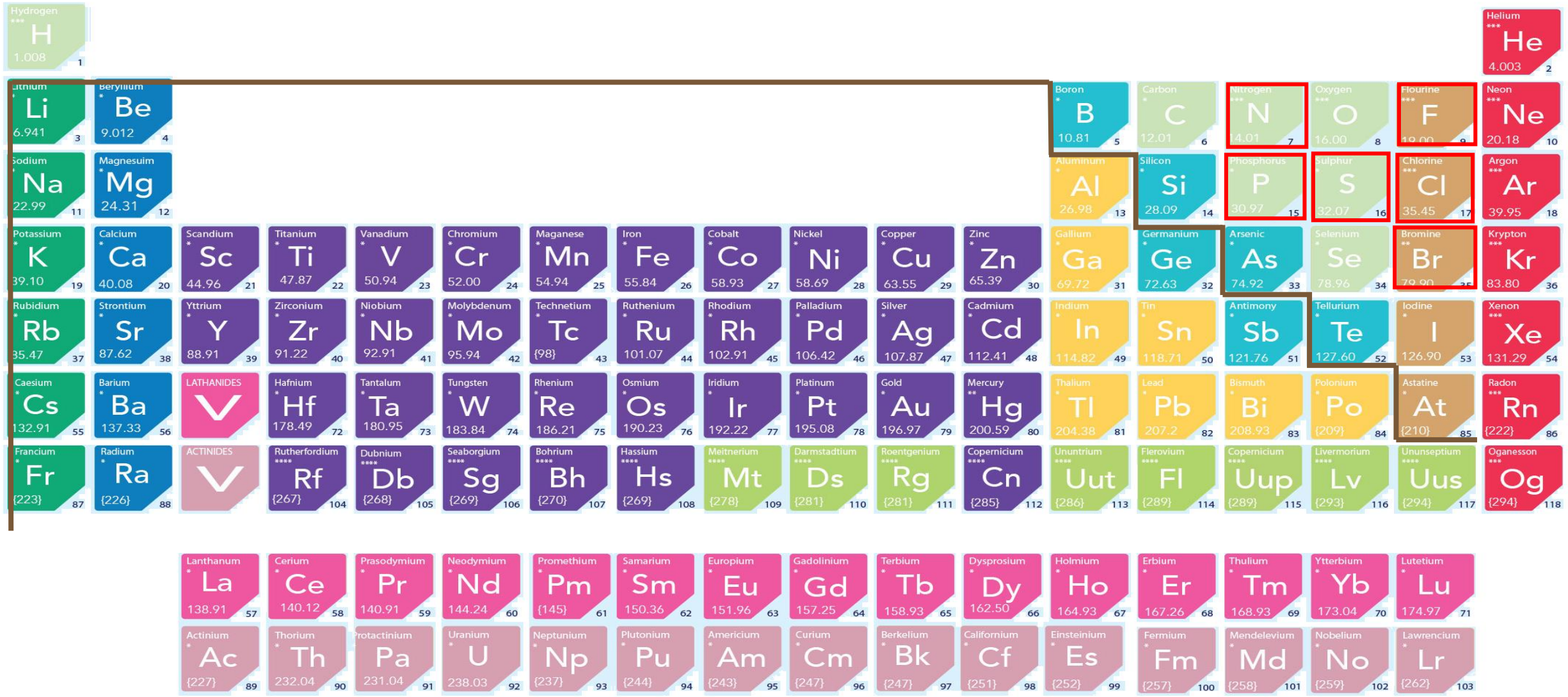
< 5mg/L

Ras El-Ain 1900
Gertrude Bell
Archive at Newcastle University
in England

Designation	Calcium limit 200	Cadmium limit 0.005	Copper limit 1	Iron limit 0.3	Magnesium limit 50	Lead limit 0.1	Zinc limit 5
SF-1	120	N.D.	0.23	6.52	24.5	0.26	0.73
SF-2	108	N.D.	0.23	7.02	22	N.D.	0.85
SD	122	N.D.	0.15	5.62	24.3	N.D.	1.43
SA	100	N.D.	6	2.82	20.4	N.D.	1.43
MS	116	N.D.	0.53	6.28	23.7	N.D.	1.44

Chemical Tests *

Anions: Br, Cl, F, NO_2, NO_3, PO_4, and SO_4



Ionic Chromatography (IC)

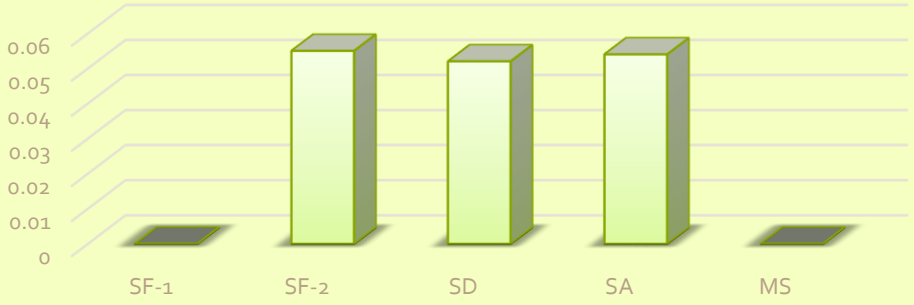
Retention in ionic chromatography is based on attract of solute ions (from the water sample) to charge sites bound for stationary phase.

Dihydrogen Phosphate

Non Detected

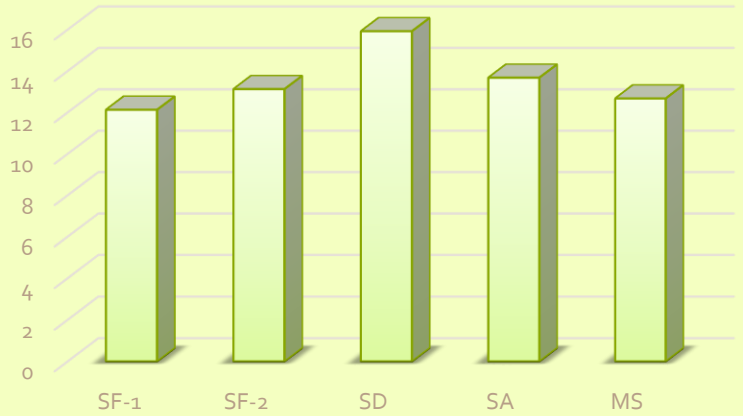
< 0.005mg/L

Br -



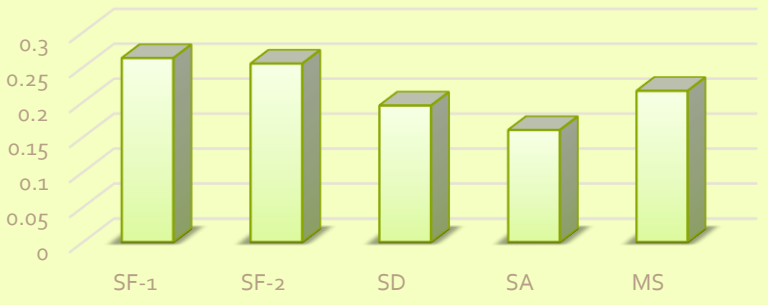
<0.2mg/L

Cl-



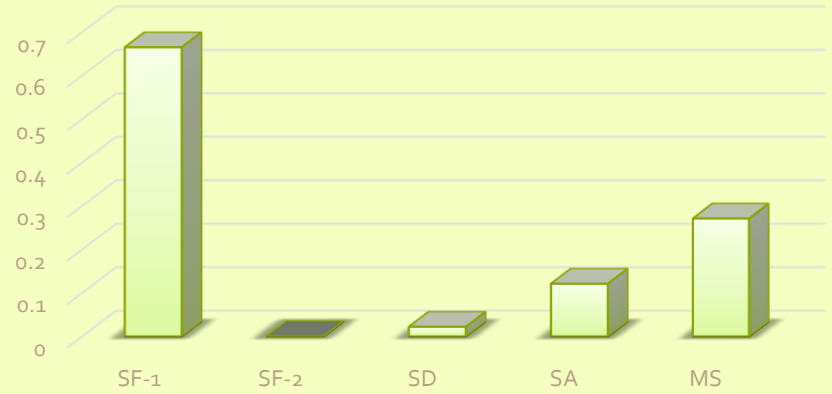
< 200mg/L

F -



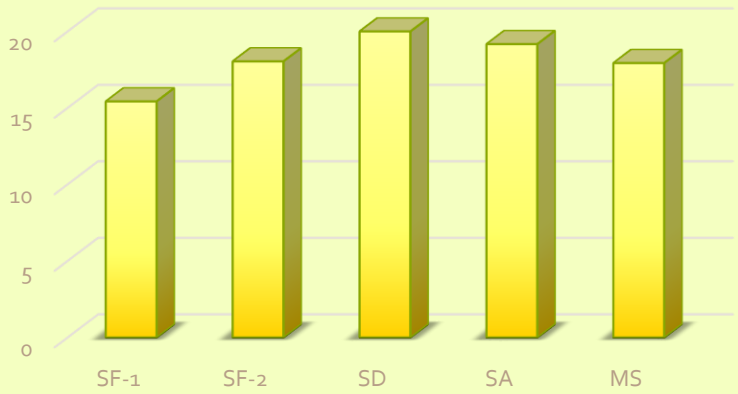
< 1mg/L

NO_2^-



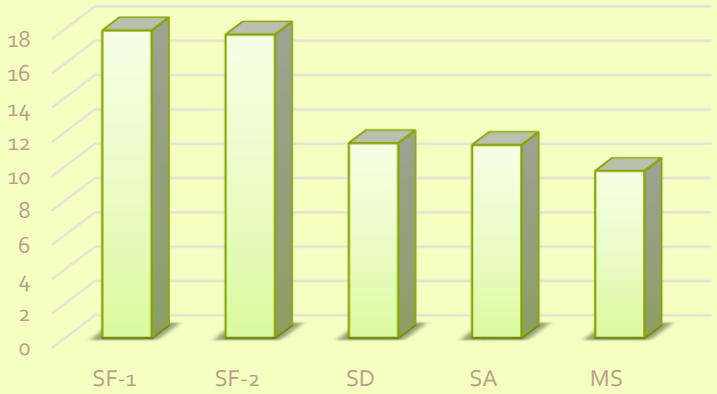
< 1mg/L

NO_3^-



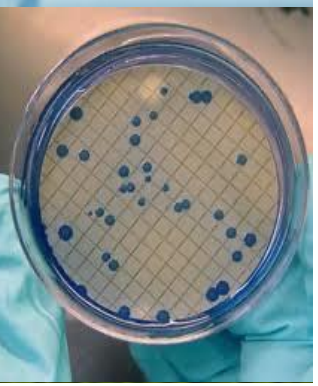
< 10mg/L *

SO_4^-

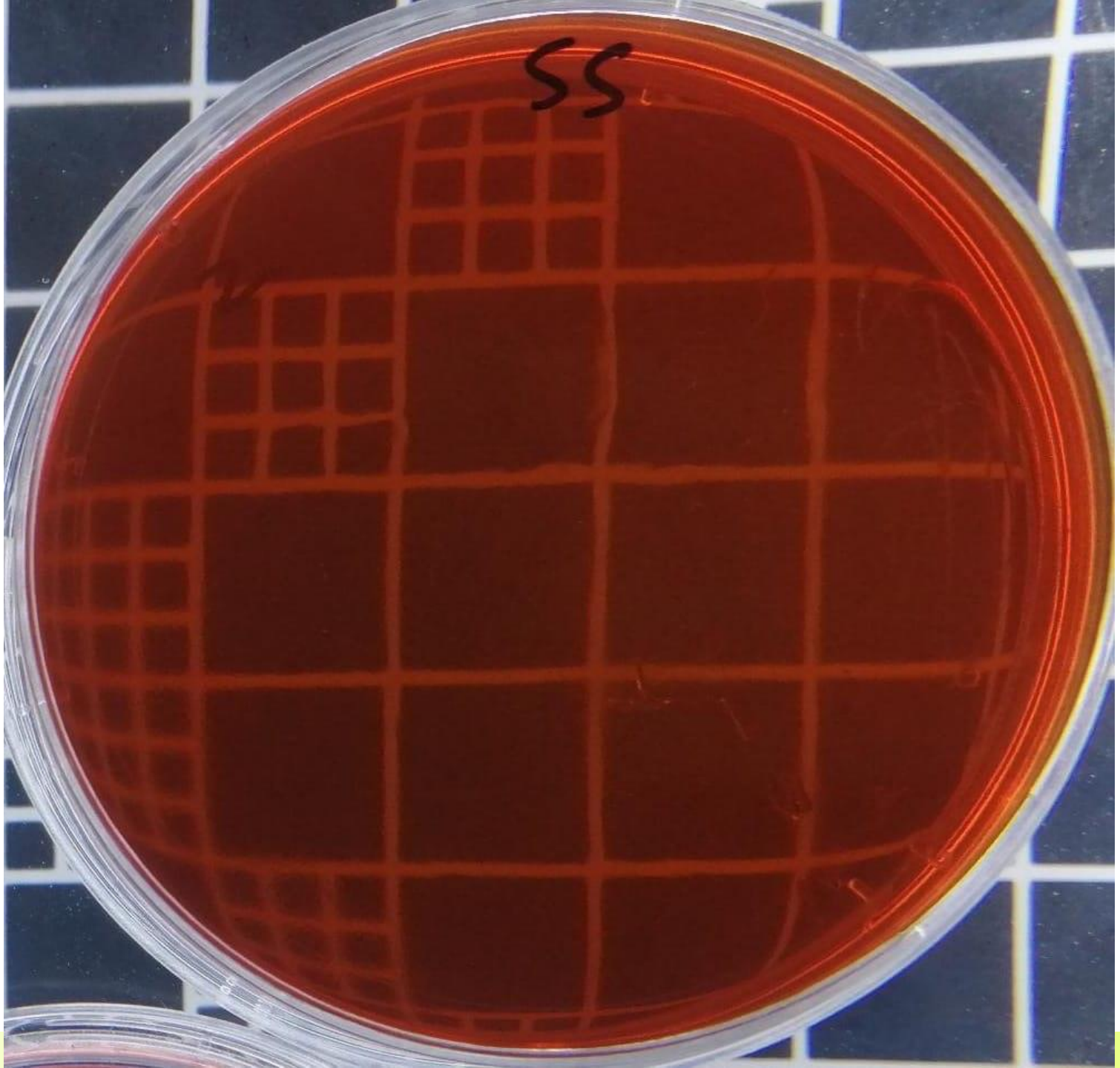


< 250mg/L

Designation	Br^- limit 0.2	Cl^- limit 200	F^- limit 1	NO_2^- limit 1	NO_3^- limit 10	$H_2PO_4^-$ limit 1	SO_4^- limit 250
SF-1	N.D.	12.124	0.263	0.665	15.42	N.D.	17.901
SF-2	0.055	13.122	0.255	N.D.	18.039	N.D.	17.66
SD	0.052	15.917	0.195	0.022	19.998	N.D.	11.334
SA	0.054	13.673	0.16	0.121	19.17	N.D.	11.231
MS	N.D.	12.669	0.216	0.271	17.931	N.D.	9.717



Microbiological Tests



Salmonella Shigella agar (SS) at 37°

Non Detected *

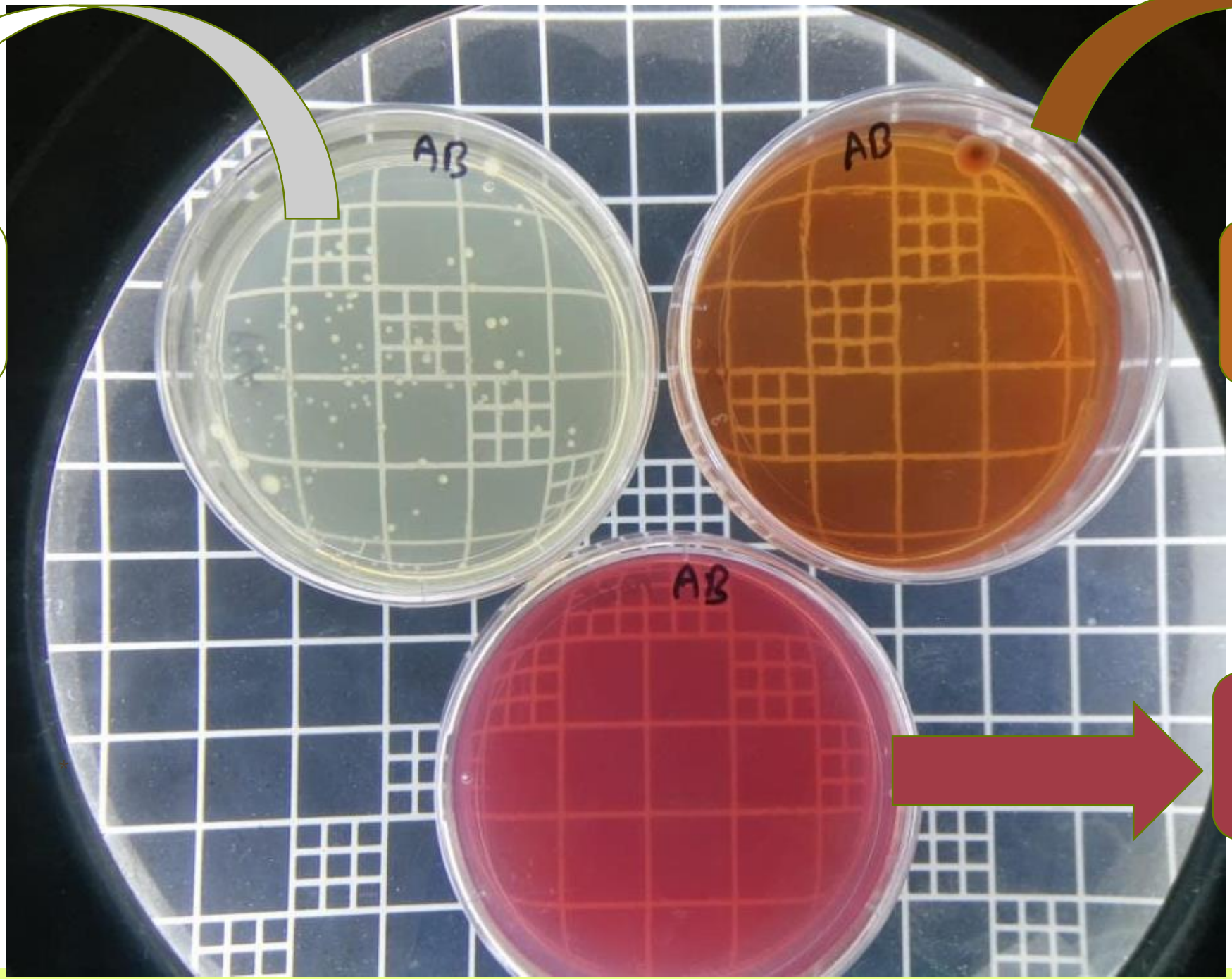
0

Salmonella Shigella agar (SS) at 44°

Non Detected

0

Total Coliforms
PCA

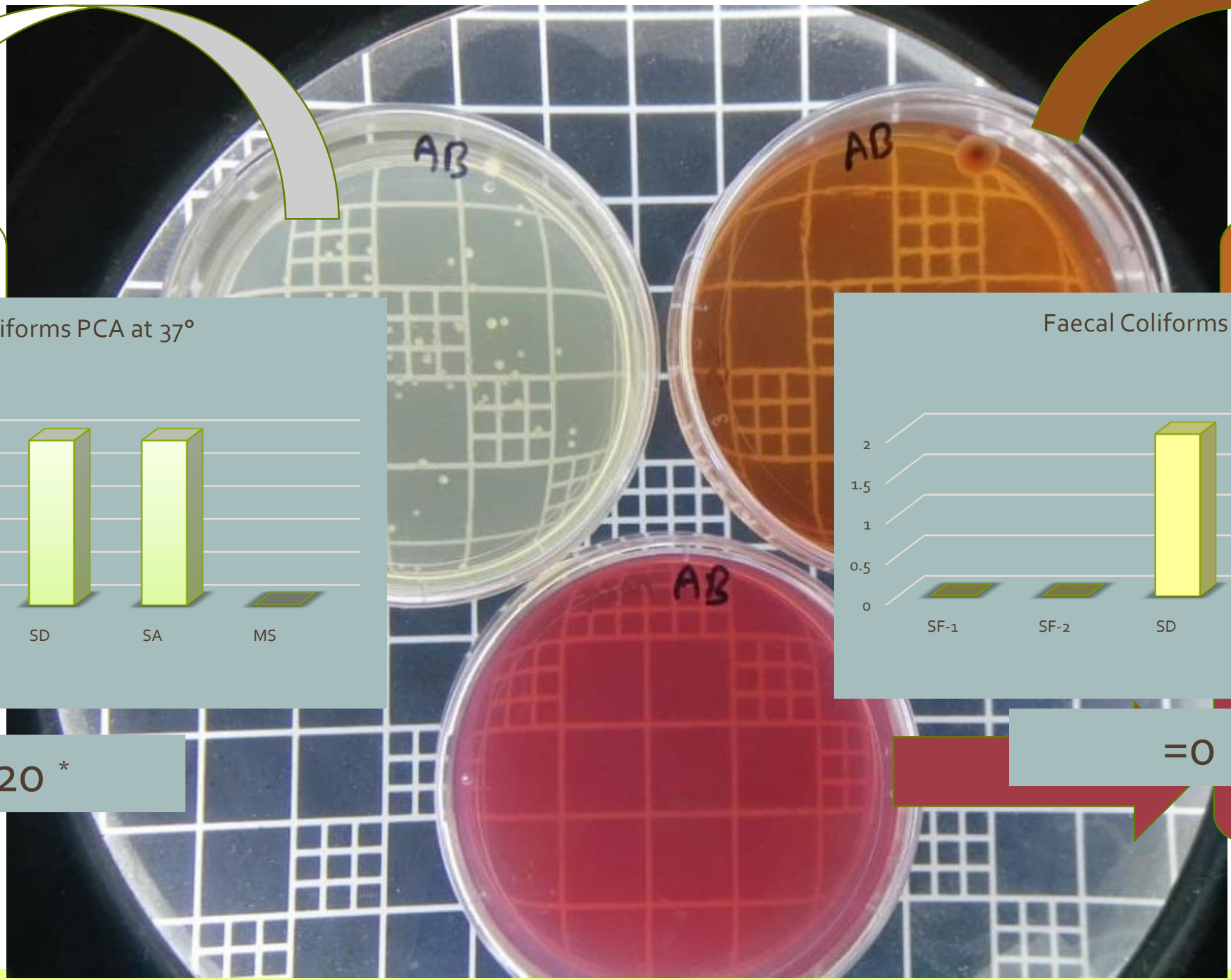


Salmonella
Shigella

Faecal Coliforms

Total Coliforms

Salmonella

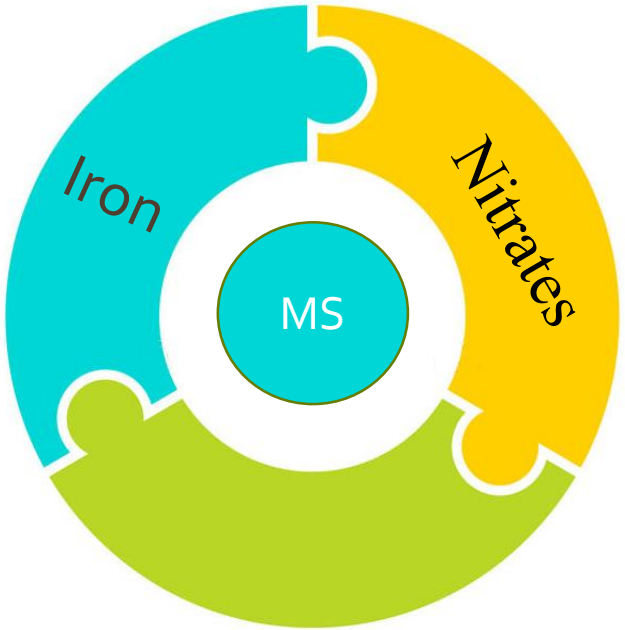


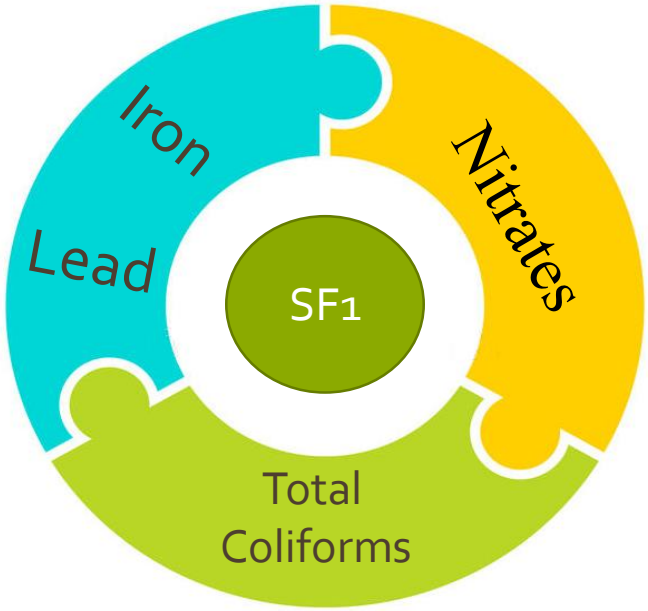
>20 *

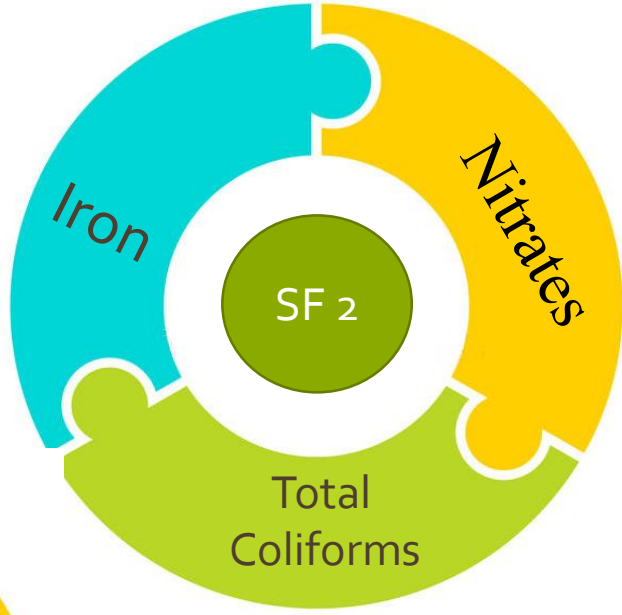
=0

oliforms

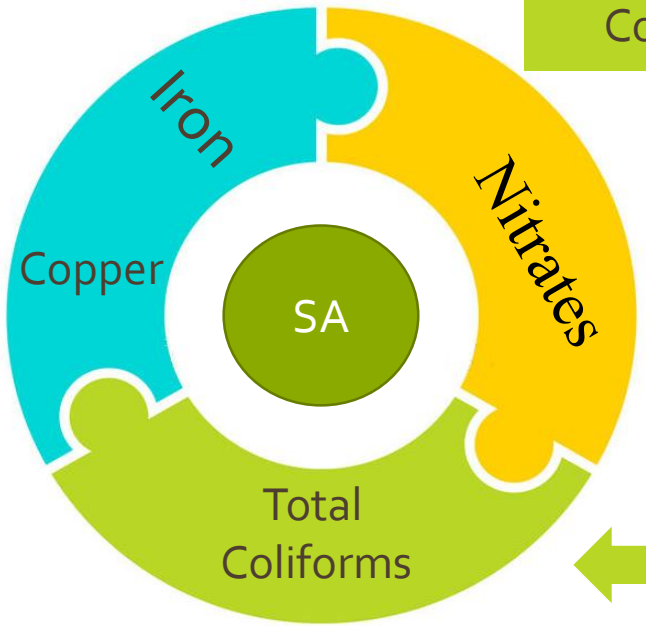
Summary *

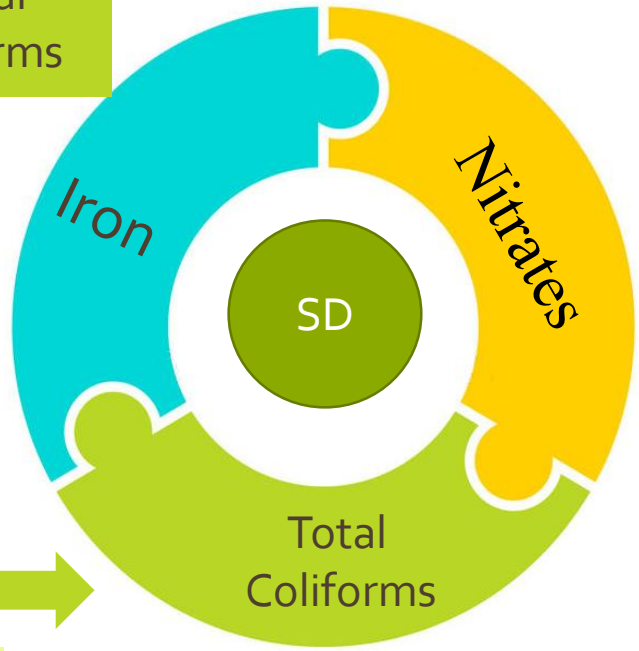






Faecal Coliforms





Cations

Anions

Microbiological

Discussions

- The presence of **iron** in natural water supplies (**five sources**) is due to rock and mineral decomposition, acidic mine drainage, uncontrolled landfill leaching, sewage effluents, and release from iron processing industrial sectors.
- The corrosion process in the plumbing systems of old houses or water networks near **SF1** increased the dissolution of **lead** into the water.
- It was seen that agricultural activities were developed all around the site **SA** thus hindering the uncontrolled use, and the application of fungicides and algicides leads to the increase in the **copper** concentrations.

Discussions

- The high values of **nitrates** (**five sources**) are due to the excessive use of domestic waste, and uncontrolled domestic waste spilled near the reservoirs and most importantly the untreated sewage disposed in the area.
- Due to the existence of **Total Coliforms** and **E. Coli (Faecal Coliforms)**, the natural water derived from such sources is not suitable for drinking. In addition treatment method should be considered, because they are contaminated and polluted by this bacteria.

Recommendations

Improve the knowledge, and the orientation on the problem of water by integrate the essential aspects of the pollution for water and its sources.

Educate residents about the installation of treatment filters to purify water by suggest materials to dispose of solid, and microbiological pollutants.

Develop monitoring systems to periodically record water quality.

Prevent excessive application of fertilizers to agricultural land.

Dedicate well-defined landfill sites.

Monitor and apply environmental impact studies to preserve the quality of water resources.

Application of the polluter-pays principle to all users.

Legislation and environmental laws should be enforced with a focus on pollution and water consumption.

Government control should be applied over water resource areas, including rivers, springs, and lakes.

Put in place laws regulating the Physiochemical quality of domestic and industrial discharges..

At the End….

- The discussion of major healthy problems that threaten Lebanon is open….
- Nowadays, we record the appearance of Cholera…. The Ministry of Public Health announced in a recent published report "220 cases and 6 deaths".
- **THANKS' to the organizers of this conference (ISWPT 2022)** that give us the opportunity to participate and highlight on our problem, hope that we can get over this soon.

THANK YOU

RESERVOIRS OF RÂS EL 'AIN AND PART OF THE ROMAN AQUEDUCT.

Close to this spot stood Palæotyrus, of which no vestige now remains, the materials having been carried away by Alexander (332 B.C.) to construct the mole or causeway which unites insular Tyre to the mainland.