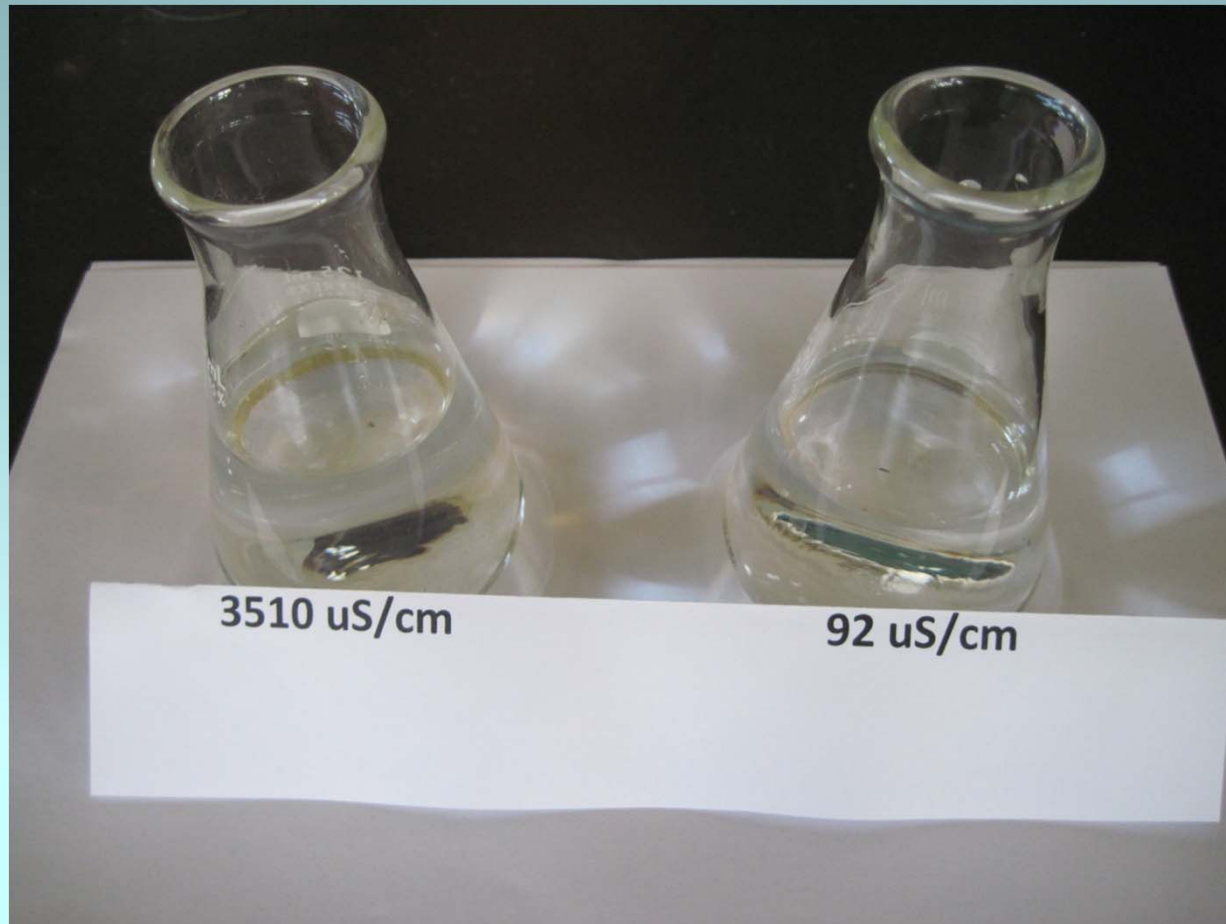




Soil, Water, and Plant Testing

Laboratory Methods and Analyses





3510 uS/cm

92 uS/cm







Date: 8/5/16
Contents: Ruth Wagner

Preparation







Analyses Usually Involve:

- What needs to be analyzed?
- What procedures and equipment must be used to do the analysis?

Analytical Methods

- Gravimetric
- Total suspended solids
Total dissolved solids
% dry matter in plants
and soil

- Involves weighing the
sample

How accurate

1 g

0.1 g

0.01 g

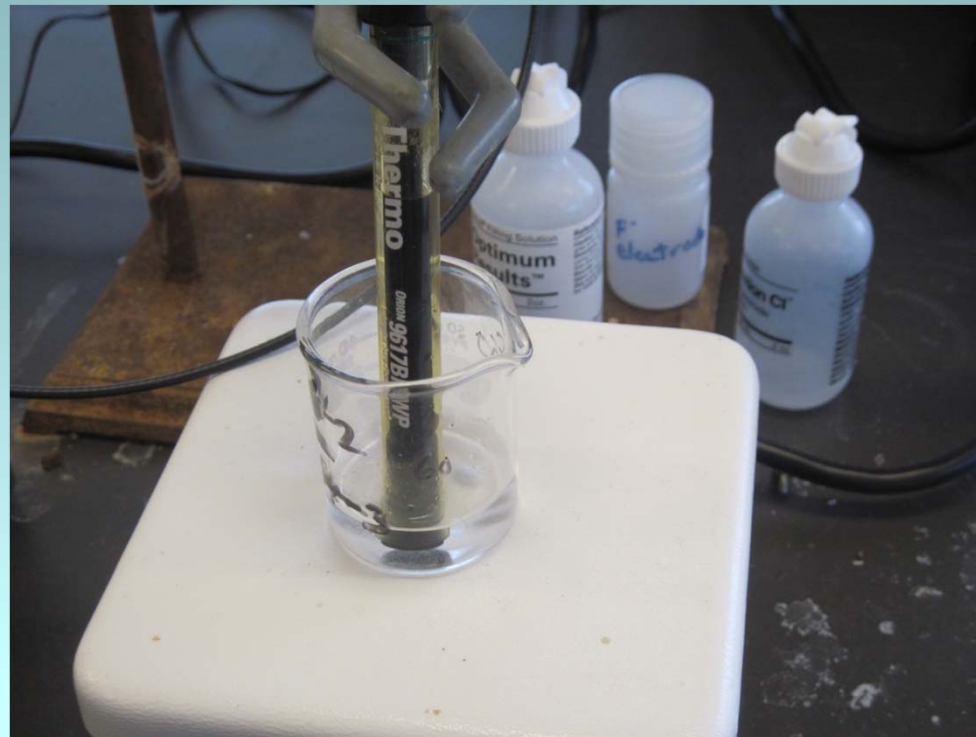
0.001 g



Analytical Methods

- Electrochemical
Meters with electrodes
- pH
measures acidity
- Electrical conductivity
mmhos/cm, dS/m,
mS/cm, umhos/cm,
uS/cm
- Ion selective electrodes
Cl, F, CN





Extraction Methods

- Liquid-liquid extraction
- Transfer analyte from water to organic solvent
- Solid phase extraction
- sample passed through column or filter



Digestion processes

- TKN
- organic N + $\text{NH}_4\text{-N}$
- Total minerals
- Total P

- Block digesters
- Microwave Digestion

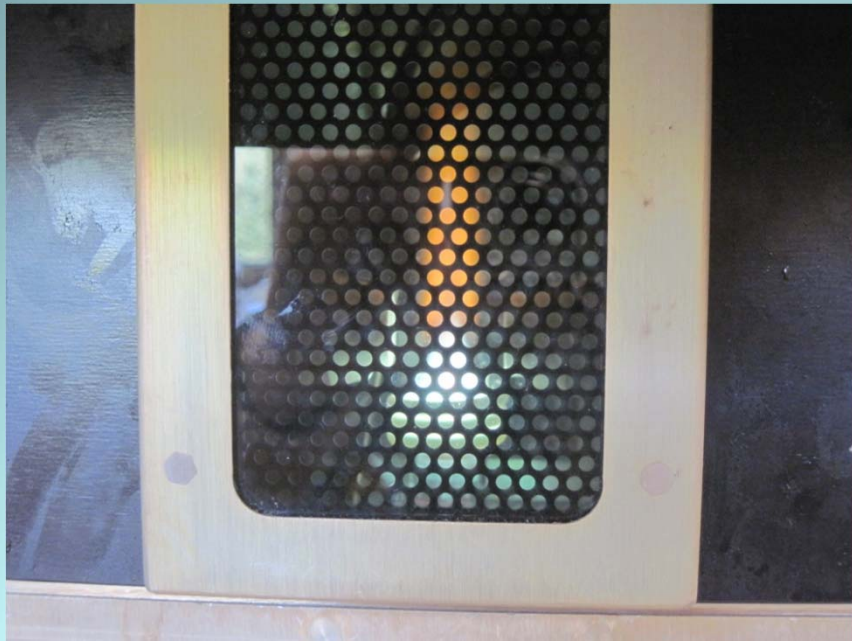




Optical Methods

- Inductively coupled plasma
 - Light emission
 - Analyze up to 64 elements at one time

- Atomic absorption
 - Light absorption
 - Analyze 4 elements sequentially



- Colorimetry
- Measure the color intensity of a sample extract or water sample after adding a color developing reagent



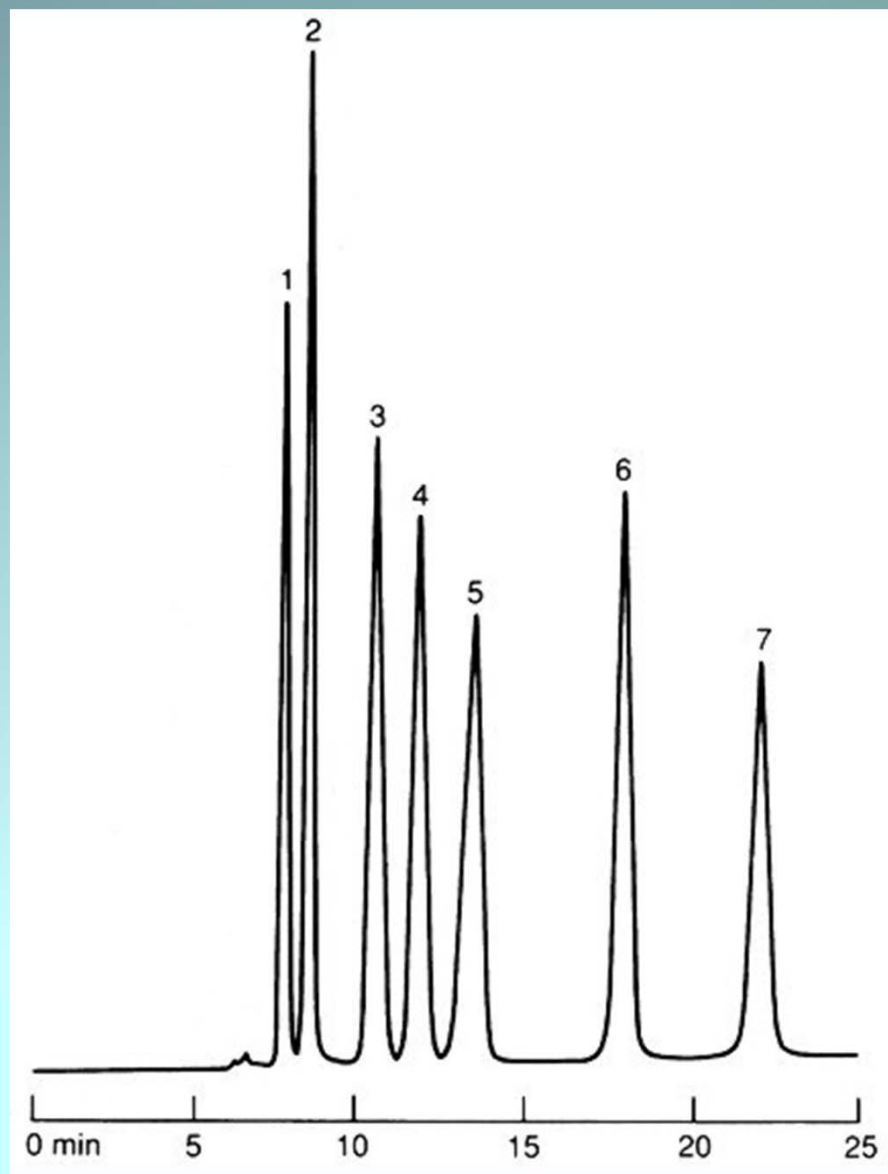
- Colorimetric measurements for:
- Ortho P
- Organic matter
- Nitrate, nitrite, ammonium
- Tannins





Chromatography

- Separate compounds based on their affinity for a solid phase
- Components identified by their retention times
- Concentrations of analytes determined by their peak height and width



Chromatography

- Gas chromatography
 - pesticides
 - PCB
- High performance liquid chromatography
 - herbicides
 - pharmaceuticals
- Ion chromatography
 - F, Cl, Br, NO₃, NO₂, HPO₄, SO₄

Furnace Methods

- Total N and total C in soil or plants
 - Leco TruSpec C/N
 - Total organic C by subtracting out inorganic C
 - Measure in %

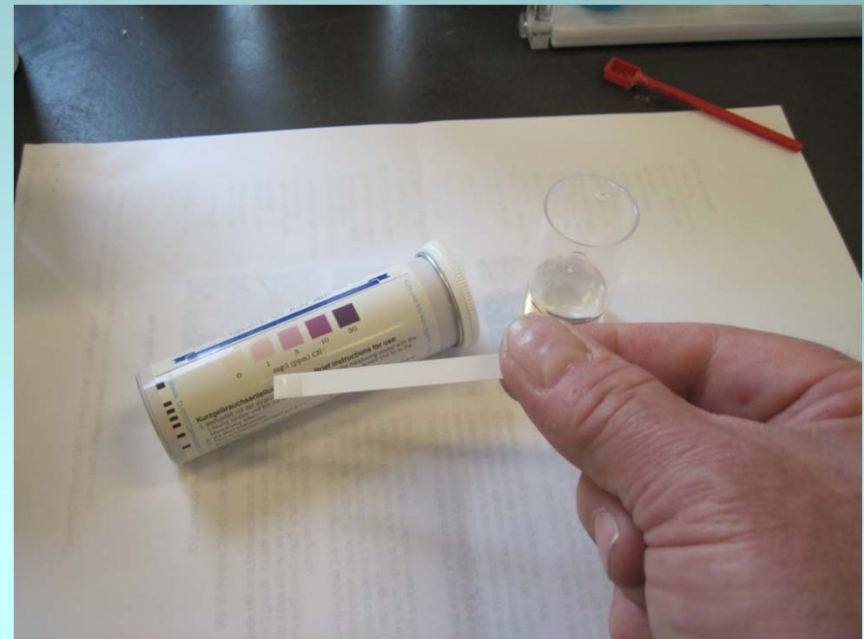
- Total N and Total C in water
 - Carl Erba or Shimadzu
 - Measure in mg/L
 - Can acidify the sample to get TOC



Field Methods

pH, EC with portable
meters

Cl, NO₃-N, ortho-P



Quality Control

- Always a part of every lab procedure
- Labs participate in quality control programs
 - EPA
 - North American Proficiency Testing Program
 - State certification programs
- Components of QC
 - Analyze certified NIST samples
 - Analyze in-house check samples
 - Analyze blanks, duplicates, spike recoveries
 - Determine detection limits

Quality Control

- Field Measurements
 - Use fresh reagents
 - Calibrate instruments
 - Analyze check samples, and blanks
 - Remove the batteries before storing instruments
 - Have fresh batteries on hand
 - Handle chemicals with care
 - Dispose of chemicals in the appropriate manner
 - Wear safety glasses and gloves

Conclusion



