

8.E.1.3 – WATER QUALITY

what will we know?

- ★ What makes water **potable**
- ★ How **turbidity**, temperature, **pH**, and **dissolved oxygen** can effect the health of a water system
- ★ What **bioindicators** are and how they can help determine the health of a water system
- ★ What the **EPA** is and how they help keep our waters clean

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WATER SYSTEM HEALTH

what effects it?

- ★ When it comes to the **health** of a water system, there are many factors that go into it. The balance between **physical**, chemical and **biological** variables determines the health of a water system

PHYSICAL	CHEMICAL	BIOLOGICAL
<ul style="list-style-type: none">- Temperature- Turbidity- Water Movement	<ul style="list-style-type: none">- Dissolved oxygen (+ other gases)- pH- Nitrates- Salinity	<ul style="list-style-type: none">- Fish- Algae- Insects- Plants

These variables are subject to **change** from both natural and **man-made** forces

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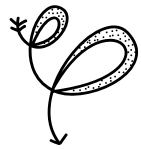


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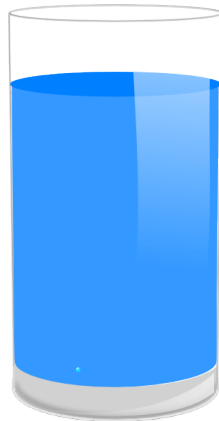
WATER SYSTEM HEALTH

why do we care?

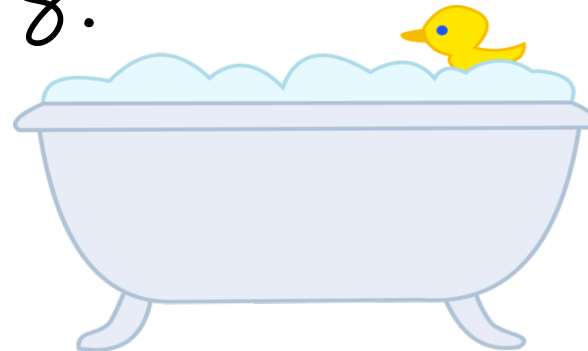
- ★ Freshwater is a major **concern** because it is the source of water for humans and animals
- ★ Our freshwater that we use can be classified as **SAFE** or **POTABLE**



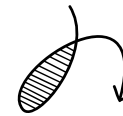
HEALTHY
ENOUGH TO
DRINK



vs.



HEALTHY ENOUGH TO **BATHE**
IN AND CLEAN WITH



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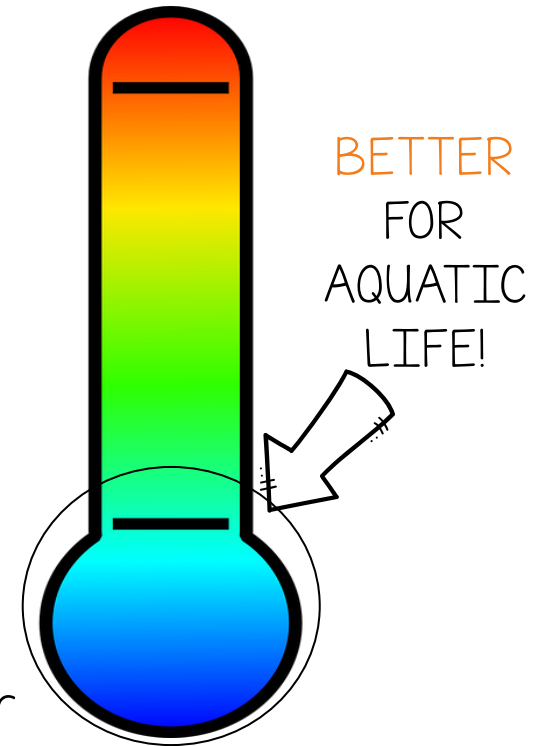


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PHYSICAL INDICATORS

temperature

- ★ The **temperature** of a body of water determines the **organisms** that can live there
- ★ Many organisms have a preferred temperature range where they will thrive
 - ★ THINK ABOUT IT! Can we live in -50o weather but SOME CAN!
- ★ As the temperature **increases**:
 - ★ It is able to **dissolve** more **sediment** which can block light and not allow **photosynthesis** to occur
 - ★ It dissolves **LESS oxygen** (because particles are moving too fast and O₂ can escape into the air) and may not contain enough for organisms to survive



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PHYSICAL INDICATORS

turbidity

- ★ Turbidity is how clear/cloudy a body of water is
 - ★ Cloudiness is due to the amount of sediment dissolved in the water
 - ★ A HIGH turbidity = not potable
 - ★ Can lead to increased temperatures, decreased DO, and impairment of some aquatic organisms



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CHEMICAL INDICATORS

dissolved oxygen

- ★ Dissolved **oxygen** is the amount of oxygen in water that is **available** for aquatic organisms to use
 - ★ The level of oxygen in surface water is important for many organisms such as **zooplankton** and fish to thrive
 - ★ There are **two** ways oxygen gets into the water:



1. From the **AIR** (being trapped by waves and moving currents)
2. From **PLANTS** releasing O_2 during **photosynthesis**

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CHEMICAL INDICATORS

pH level

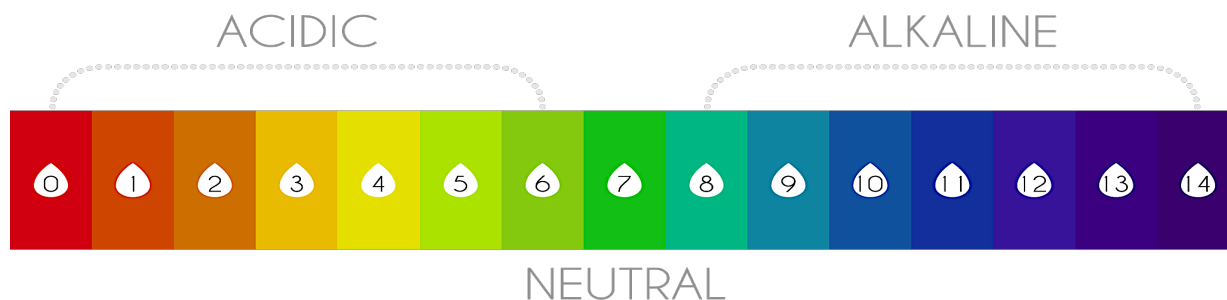
★ The pH of a body of water determines how acidic or how basic it is

★ pH is measured on a scale from 0–14

- 0–6: ACIDIC
- 7: NEUTRAL
- 8–14: BASIC (Alkaline)

★ The pH of water is known to have a synergistic effect, which means that materials (iron, aluminum, ammonia, mercury) introduced into bodies of water can have more or less of an impact based on the pH of the water

□ EXAMPLE: Metals in more acidic water can become more dangerous or poisonous than they normally would be in neutral water



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CHEMICAL INDICATORS

nitrates + phosphates

★ Nitrates and phosphates come from Nitrogen and Phosphorous, which are essential nutrients for healthy plant growth.

★ Too many nitrates or phosphates in drinking water can make it unhealthy

SOURCES OF NITRATES

- Runoff contaminated with fertilizers
- Septic tank leaks
- Sewage

SOURCES OF PHOSPHATES

- Human and animal waste
- Laundry
- Cleaning and industrial waste



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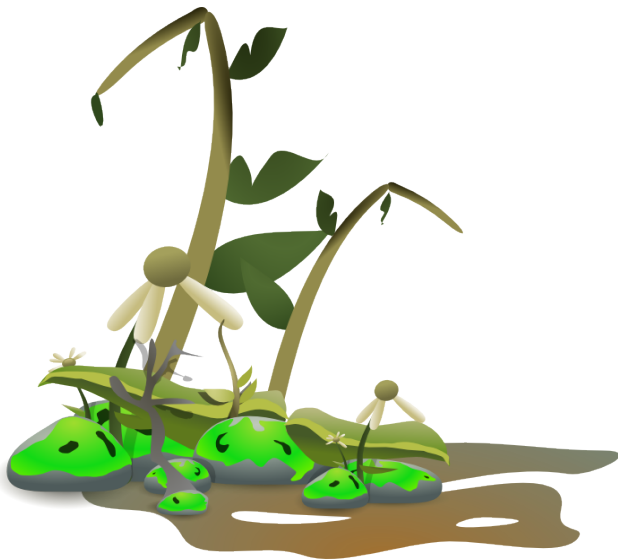


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CHEMICAL INDICATORS

salinity

- ★ **Salinity** is the measure of **salt** in water and can be an indicator of how healthy a water system is
 - ★ Salinity can enter water systems through natural processes of **weathering** rocks from wind and rain
 - ★ **High** concentrations of salinity can cause vegetation to become unhealthy or die and can lead to a **decrease** in biodiversity



AMOUNT OF
DIFFERENT
SPECIES LIVING
IN AN AREA

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BIOLOGICAL INDICATORS

Bioindicators

- ★ Biological indicators (Bioindicators) are macroinvertebrates that can give an indication of how healthy a water system is.
 - ★ The presence and numbers of the types of fish, insects, algae, plants and other aquatic organisms can tell us how healthy the water they live in is
 - ★ These organisms are usually easy to collect and identify
 - ★ These organisms are used to measure water health because many are very sensitive to pollution.
 - Poor water quality is indicated by a few number of bioindicators organisms in one place



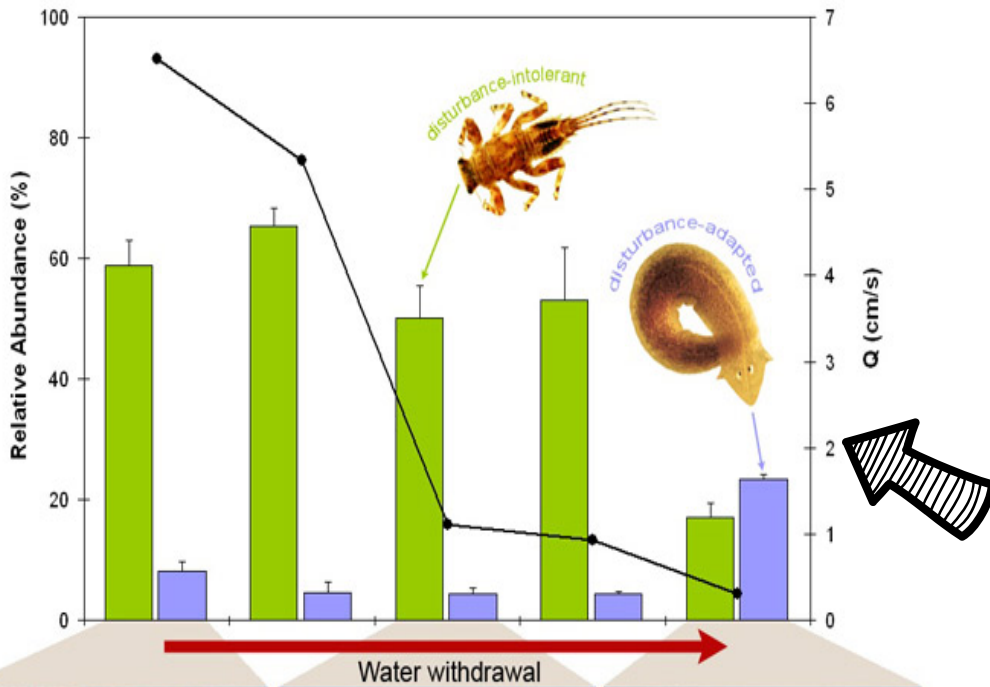
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BIOLOGICAL INDICATORS

bioindicators



The species in the **GREEN** to the right is a bioindicator species because it is **disturbance-intolerant** (which means it does not handle a change in the water well).
 – As the water withdrawal occurs, and the water system is **less** healthy for these organisms, their **abundance** numbers begin to **drop**.



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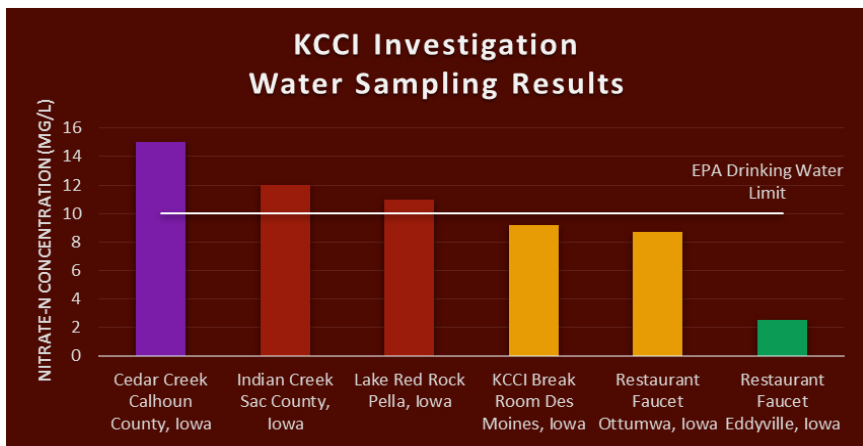
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WATER STEWARDSHIP

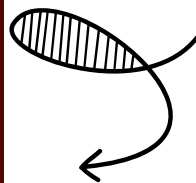
protecting our water

★ There has only been a growing awareness and concern for water pollution for the past 45–50 years. Before that, there was little concern about what was being put or dumped into our water systems.

- ★ Part of this awareness came with the development of the Environmental Protection Agency (EPA) in 1970
- ★ In 1972, the Clean Water Act established the regulations on putting pollutants into the water



This gave the EPA the authority to test for pollutants and chemicals in the water and set maximum amounts allowed to be found in the water



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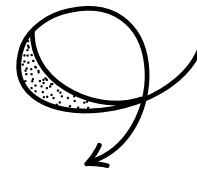
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WATER STEWARDSHIP

before the epa



The Cuyahoga River in Cleveland was so polluted with oils and chemicals that the water actually set fire!



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WATER STEWARDSHIP

after the epa

Now you can
swim in that
same river!



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