WATERSHEDS & CLIMATE: Lesson 3

We all have a role:

- The quality of water in a river or lake is influenced by both natural factors and how people use the land around it.
- Everyone is responsible for the health of the watershed and the water systems within it.
- Our actions, good or bad, have an impact on our water supply.

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WATERSHEDS & CLIMATE: Lesson 3

CSI: Water & Diseases

Investigative Questions

- What is the role of water in transmitting diseases and in human/animal wellness?
- How do the characteristics of environments that promote the transmission of diseases change with a changing climate?

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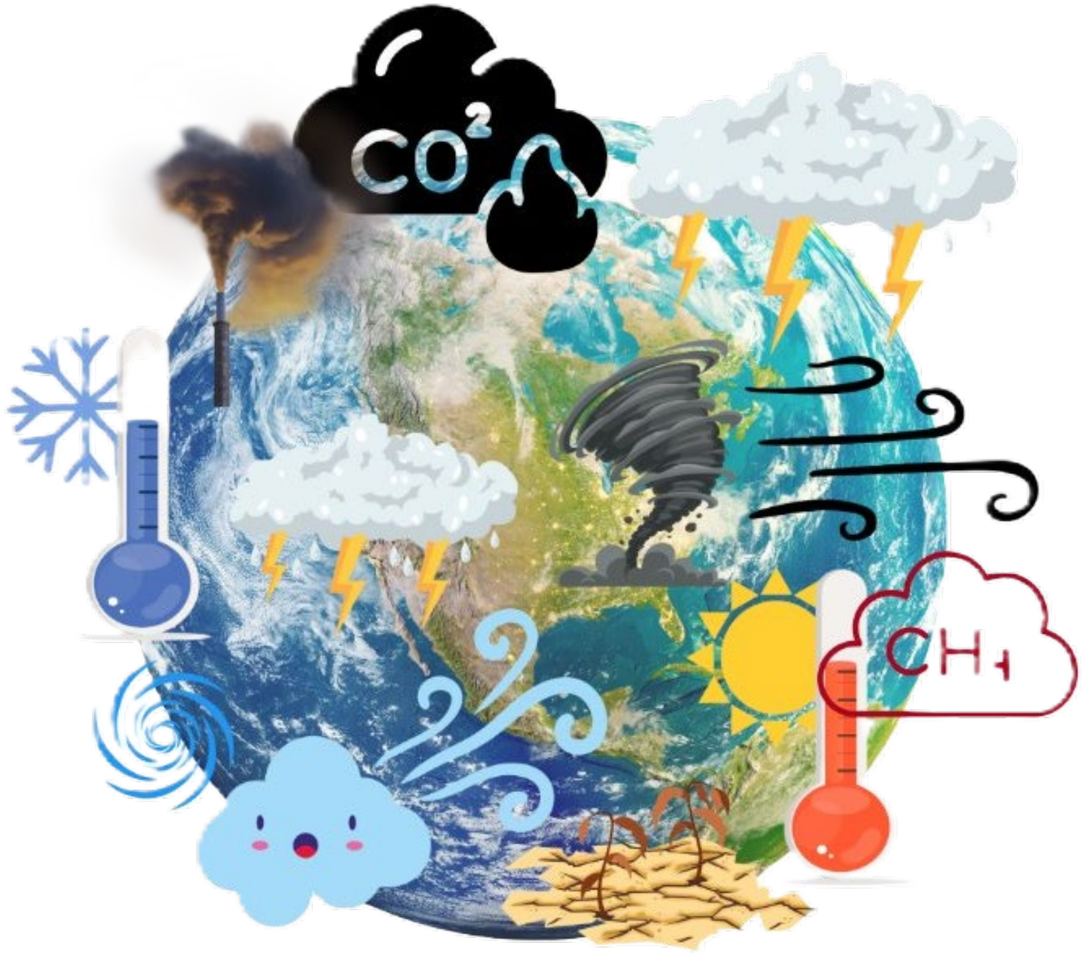
WATERSHEDS & CLIMATE: Lesson 3

Climate Change



- Climate change is a long-term shift in global and regional weather patterns and temperatures. While these shifts can be natural, the current rapid change is driven by human activity, primarily the burning of fossil fuels like coal, oil, and gas.

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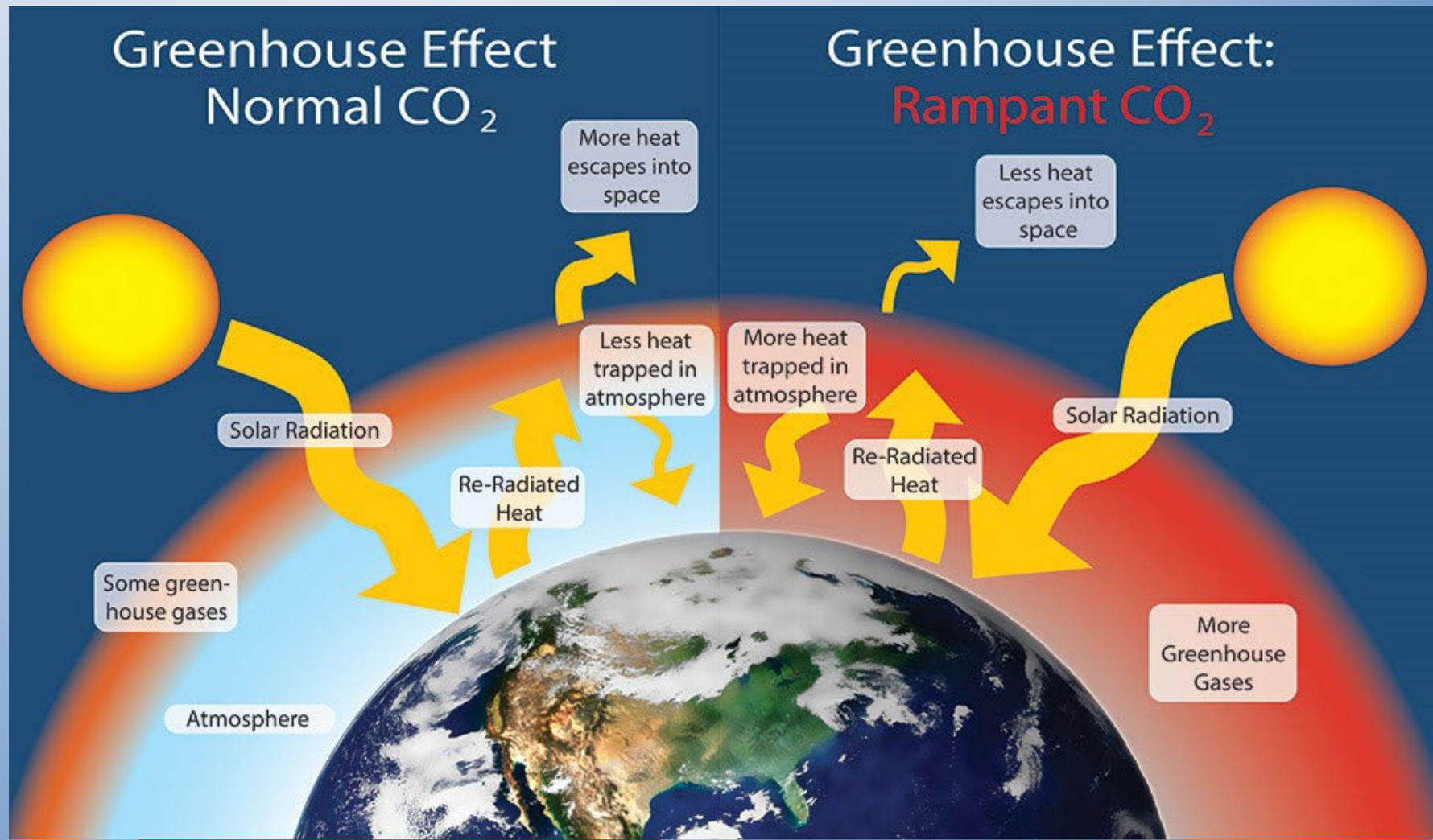
Global Warming & Green House Effect

- Global warming is the long-term heating of Earth's surface observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere.



WATERSHEDS & CLIMATE: Lesson 3

Key Human Activities

Burning Fossil Fuels

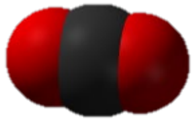
The combustion of coal, oil, and natural gas for electricity, transport, and industry is the largest source of greenhouse gas emissions.

Deforestation

Forests absorb CO2 from the atmosphere. Deforestation not only releases stored carbon but also eliminates a vital tool for regulating the climate.

Methane (CH_4)

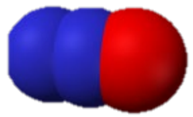
Carbon Dioxide (CO_2)



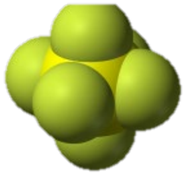
Agriculture & Livestock

Agricultural practices, particularly livestock farming, produce large amounts of methane, a powerful greenhouse gas. Fertilizers also release nitrous oxide.

Nitrous Oxide (N_2O)

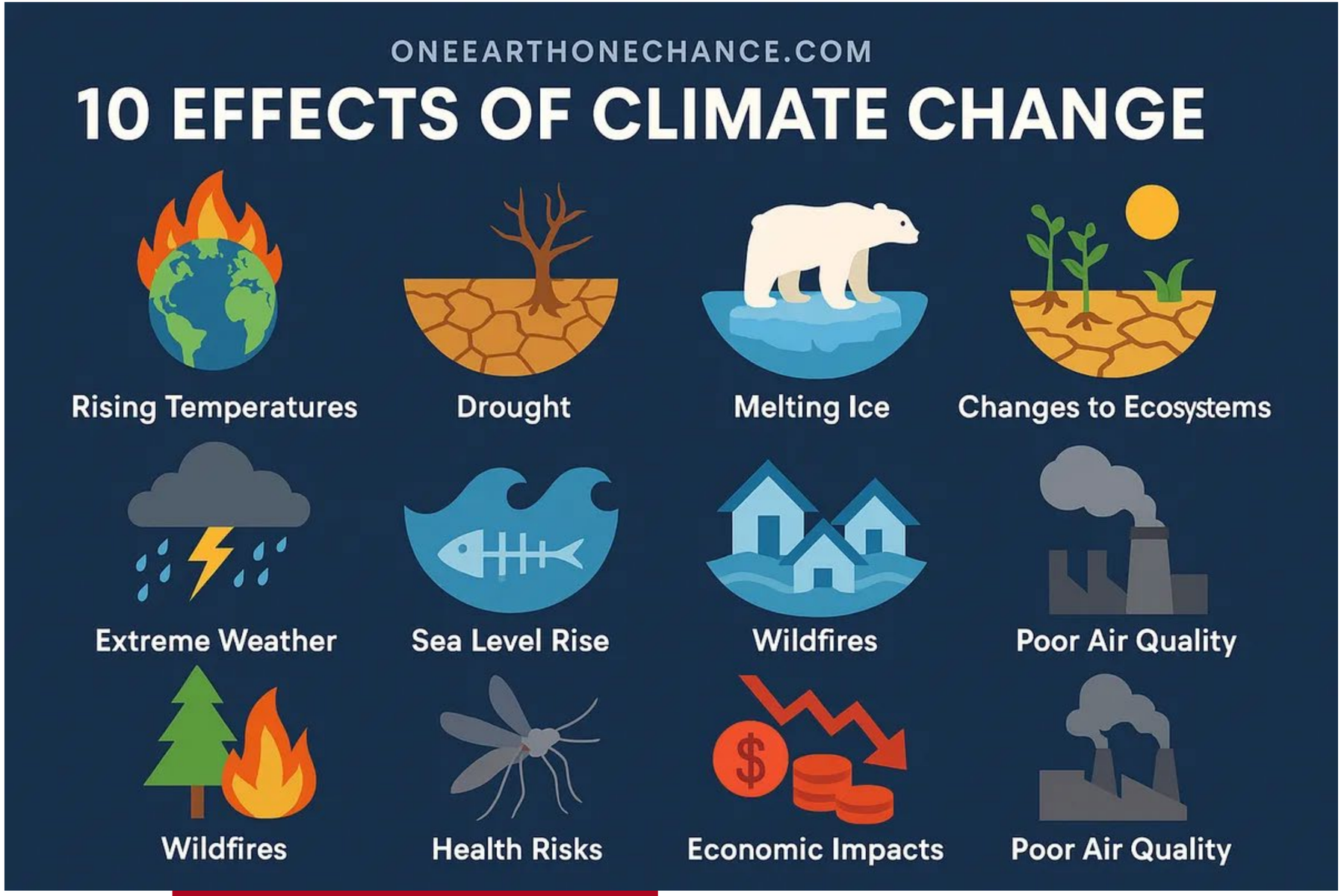


Sulfur Hexafluoride (SF_6)



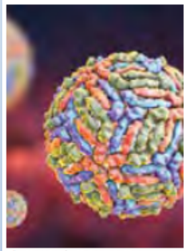
WATERSHEDS & CLIMATE: Lesson 3

Because the Earth is a system where everything is connected, changes in one area causes changes in other systems (precipitation, sea levels, catastrophic storms, water scarcity and declining biodiversity).



WATERSHEDS & CLIMATE: Lesson 3

Waterborne Diseases



West Nile Virus, transmitted from the *Aedes* mosquito

West Nile virus is most commonly transmitted through the bite of a mosquito. Mosquitoes become infected from feeding on infected birds then spread West Nile virus to people and other animals by biting them. The majority of people who contract West Nile Virus will not show symptoms. Mild symptoms such as a fever, rash, vomiting and/or diarrhea may last a few days although fatigue may last several weeks. One in 150 people may develop a severe illness affecting the central nervous system such as encephalitis (inflammation of the brain) or meningitis (inflammation of the membranes that surround the brain and spinal cord). These symptoms may include high fevers, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis.

Shutterstock_Kateryna Kon

Enterotoxigenic E. coli (ETEC) gastroenteritis, caused by *E. coli bacteria.*

A leading cause of infant mortality worldwide, E. coli gastroenteritis is best known in the United States as an affliction common to those who visit developing countries and consume contaminated water or food. ***E. coli*** bacteria was also responsible for a wide-ranging recall of spinach and other leafy greens in 2006 after three people died and more than 200 were sickened, including 30 people who suffered a form of kidney failure. Abdominal cramping, nausea and vomiting are all common symptoms of the infection.

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Activity:

- Students learn about how a changing climate may affect waterborne and vector diseases.
- They search for others who have been “infected” with the same disease as they have, learning and sharing about each disease.

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Now think about how this activity might play into the case file?

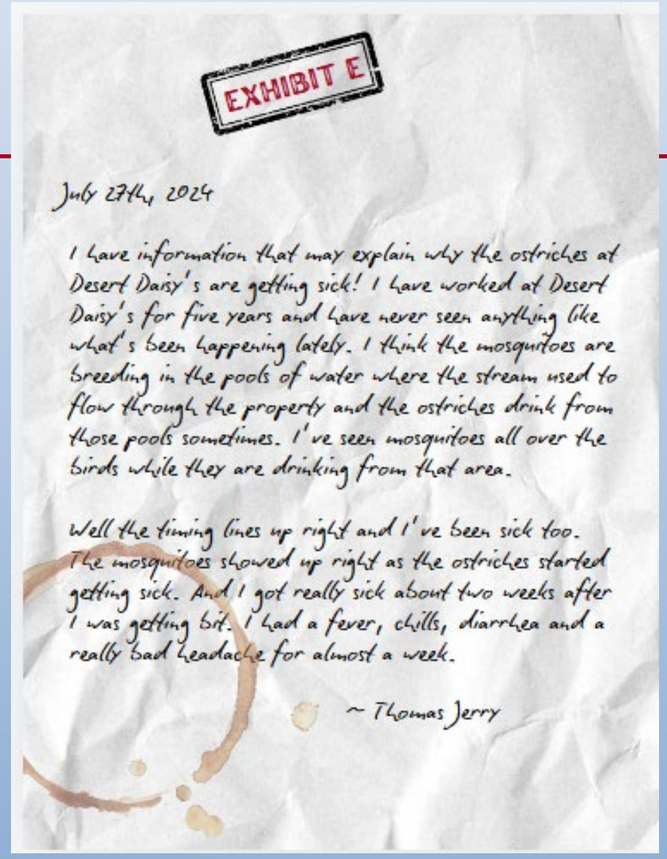
CWC FILE: #33788DD

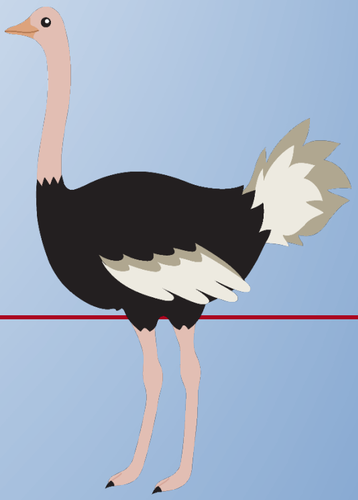
DESERT DAISY'S OSTRICH OASIS

NEW LEAD: #4

On second visit to the site detectives discovered:

- Some of the shallow pools of water from the stream had mosquito larvae in them.
- Several of the farm workers had extensive mosquito bites.
- West Nile virus has been noted in local mosquitoes in the area.
- One employee provided witness statement and lab results **Exhibit E**





➢ **Provide Lead #4 after lesson**

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Lesson 3

Systems and System Models & Cause and Effect

Wrap-Up

- Better understanding the role of water in transmitting diseases helps us be more aware of human/animal wellness.
- So how do you think climate change and new extremes will affect disease and water quality?

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Close the Case

- Final Test Results
- Final Case Synopsis

Lab Results

2. Blood Test Results

Animal ID: Ostrich #27
Date of Test: August 9, 2024
Lab Technician: John Martinez

Test Results:

Test Parameter	Result	Normal Range
Lead Level (ppm)	15.2	< 0.5 ppm
Hemoglobin	8.2 g/dL	10.0 - 12.5 g/dL
Hematocrit	24%	30% - 37%
White Blood Cells	6,500 /µL	5,000 - 8,000 /µL

Interpretation:

- **Elevated Lead Levels** - The lead concentration in the blood is significantly higher than the normal range, indicating chronic exposure to lead.
- **Anemia** - Lower hemoglobin and hematocrit levels are consistent with lead poisoning effects.

Summary:
The blood test confirms elevated lead levels, which are consistent with the lead poisoning observed in the necropsy. This confirms that lead contamination is the cause of the illness affecting the ostriches.

~ Dr. Featherbottom

Soil Analysis Report

Solaris Analytic Inc.
2276 Randy Johnson Way
Discover City, AZ 12345
www.solarisanalytic.com

Prepared for
Account 23324
Andy's Alfalfa Farm
351 Anywhere St
Discover City, AZ 12345

Sample description: bare soil from cropland
Sample taken: 7-23-2024
Sample received: 7-24-2024
Sample tested: 7-26-2024

Analyte	Detection Limit (mg/kg)	Result
2,4-D	160	60
Aldrin	84	ND
Chlordane	3300	ND
Chlorpyrifos	840	800
Dieldrin	160	ND
Diuron	160	100
Endosulfan	84	ND
Endosulfan sulfate	160	ND
Endrin	160	ND
Endrin aldehyde	160	ND
Heptachlor	84	ND
Heptachlor epoxide	84	ND
Hexazinone	84	52
Methoxychlor	840	ND
Simazine	160	70
Toxaphene	3000	ND

Detection Limit = minimum amount of substance testing can detect in soil
ND = Not Detected

Summary of Results
Although there are no established limits for pesticides and herbicides in soils, all pesticide levels detected are well below levels of concern for human and animal health.

Analyzed by Solaris Analytic Inc.
www.solarisanalytic.com
Report No. 135-42

SUSTAINABILITY & STEWARDSHIP:

My Water Footprint

Investigative Questions

- How much water do I use daily?
- Why is water use called a water footprint?
- How can I be a better water steward?

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Indirect Water Use

The water used to produce the goods and services we all enjoy. It is the water hidden or not seen by the end-user during the process or manufacturing of a good or service.

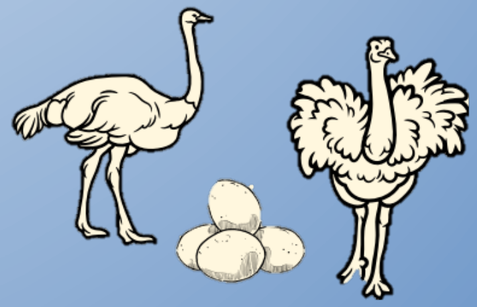
Direct Water Use

Water you use directly to do something immediately. Water that is seen, felt and used at that given time. When you turn on your faucet or hose for water.

SUSTAINABILITY & STEWARDSHIP:

What is a Water Footprint?

- It reveals water use patterns, from the individual level all the way to the national level.
- It shines a light on the water used in all the processes involved in manufacturing and producing our goods. It also accounts for water contaminated during manufacturing and production.
- A water footprint is measured in terms of the volume of water consumed, evaporated and polluted.



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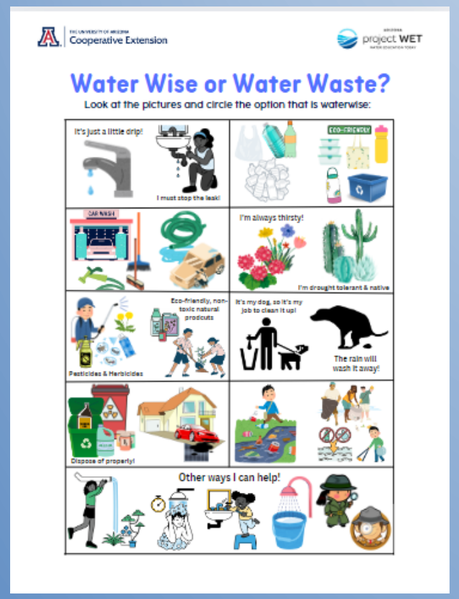
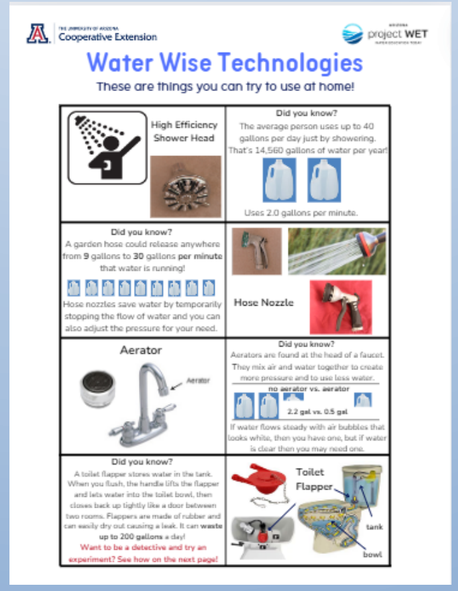
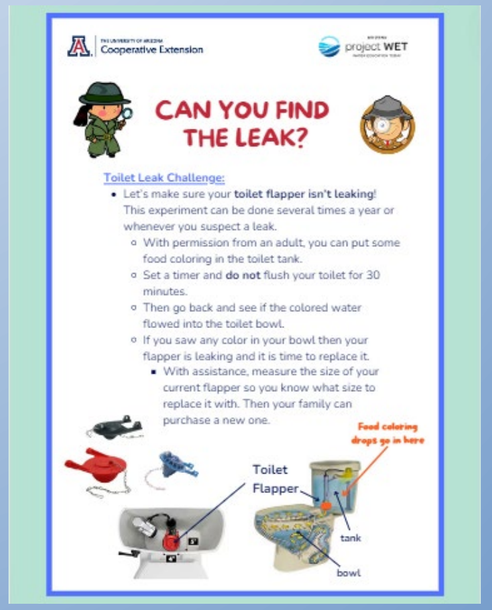
SUSTAINABILITY & STEWARDSHIP:

BE THE TIDAL WAVE OF CHANGE!

Your daily choices and actions can add up to make a positive difference.







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Splashing into Solutions

You Have the Power!

What is Water Conservation?

- Beneficial reduction in water loss, waste or use by changing behavior to use less water.

What is Water Efficiency?

- Minimize the amount of water used to accomplish a function or task. Doing more with less water. Normally relies on well-engineered products and fixtures or technology

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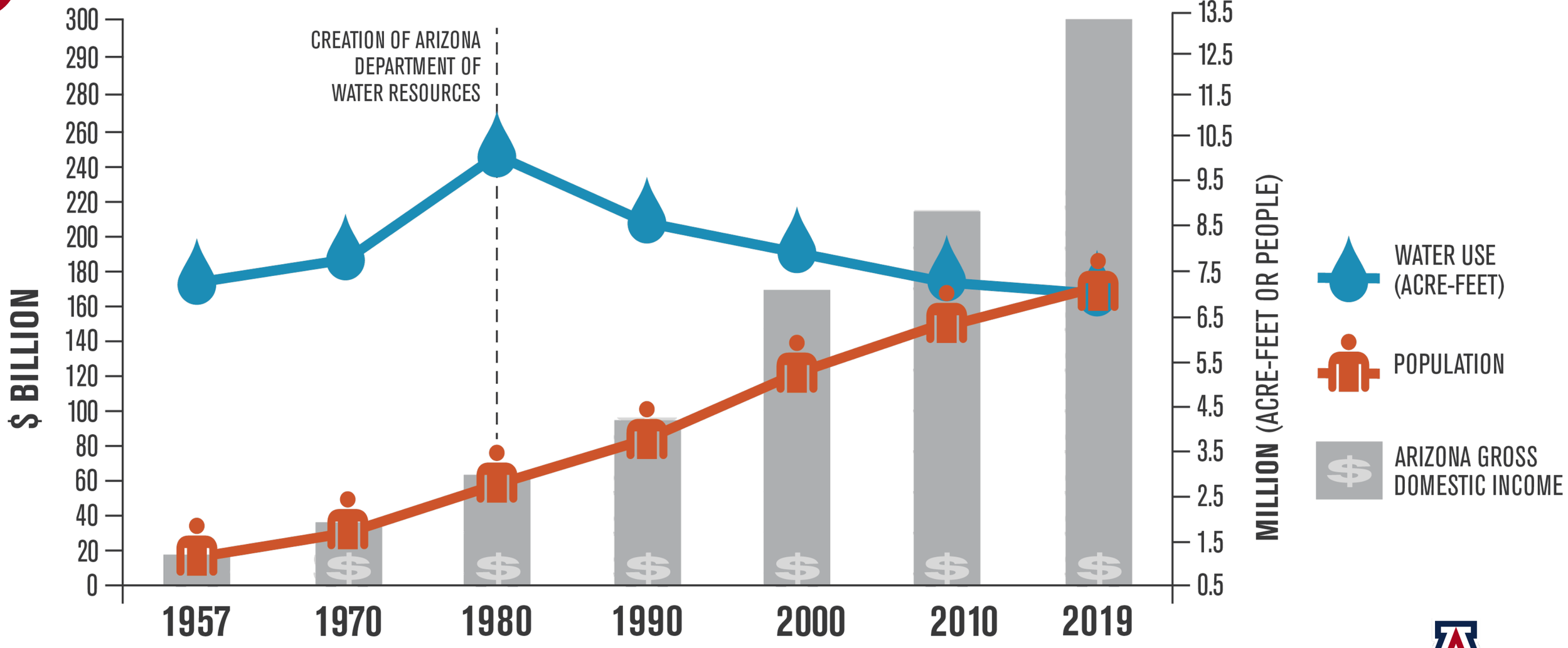

SOURCE: ADWR, 2020

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Take the PLEDGE:

I PLEDGE to be a water steward, to do my best to make smart choices and take actions that help conserve and keep our water supply clean.

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