ENVIRONMENTAL SCIENCE MERIT BADGE

http://joelhebdon.wix.com/vanilla-partners

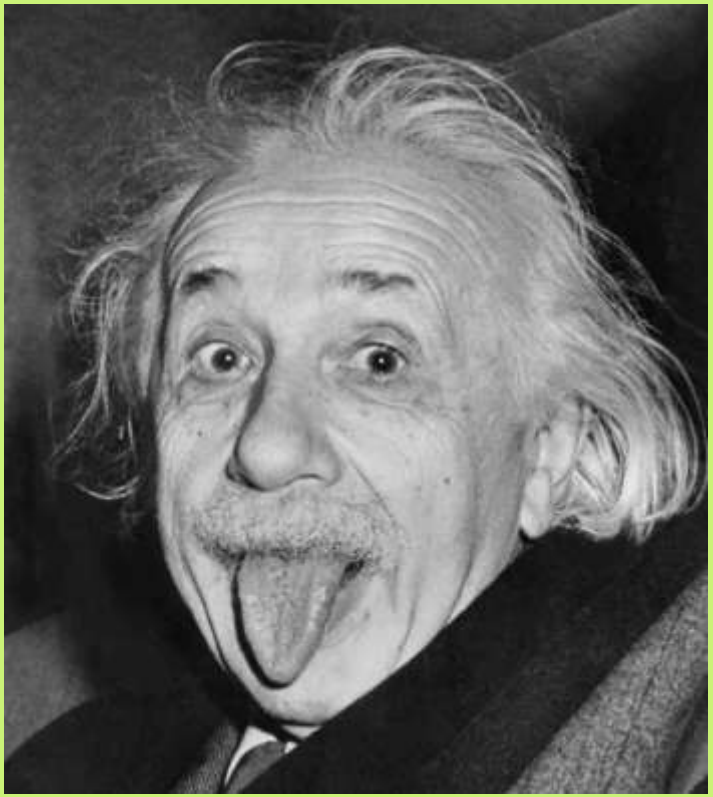
BOY SCOUTS OF AMERICA
UTAH NATIONAL PARKS COUNCIL

WHAT IS ENVIRONMENTAL SCIENCE?

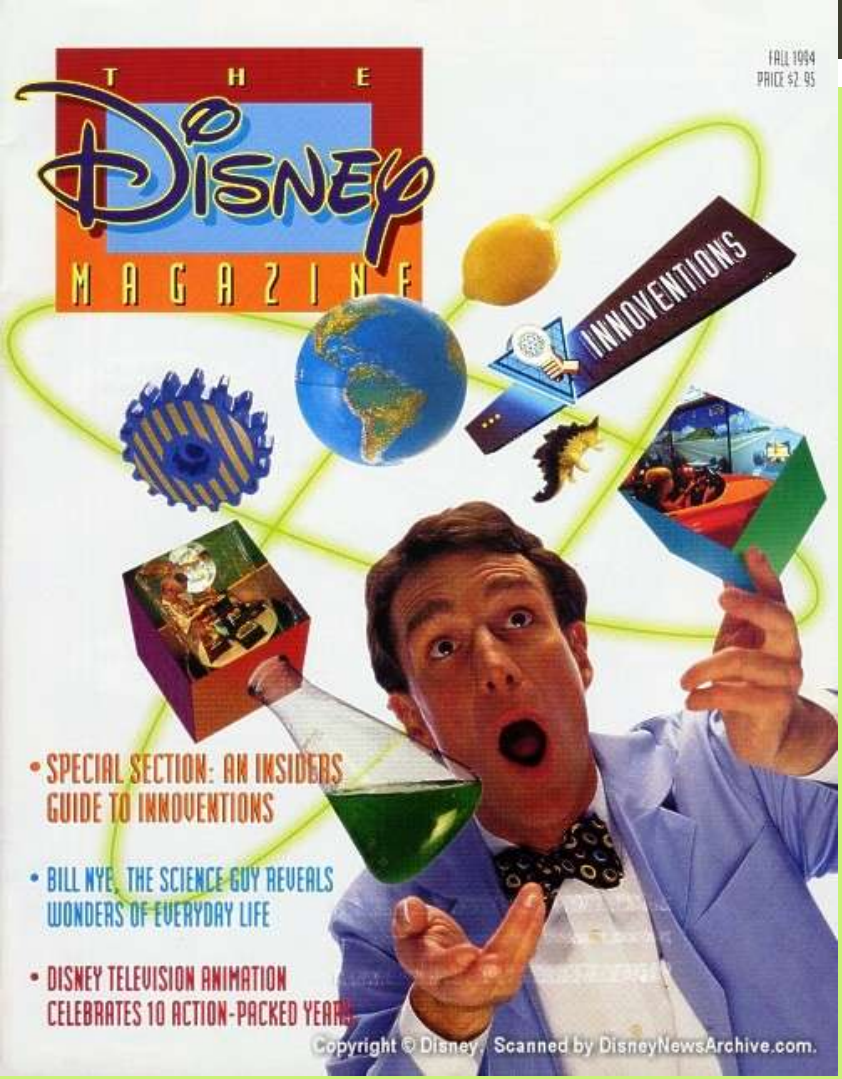
- The natural development of a living thing over time is natural history. People who study natural history are naturalists.
- A living thing's environment is made up of all the living and nonliving material around it, including plants, animals, air, soil, heat, light, food, water and anything else that plays any role in its life.
- The study of living things and their interaction with their environments is known as ecology.

THE SCIENTIFIC METHOD

- State the problem you want to solve
- Form a question that can be tested (hypothesis)
- Test your hypothesis by performing an experiment
- Analyze your results



SCIENCE IS FUN !!!



Environmental Science Merit Badge

1. TIMELINE

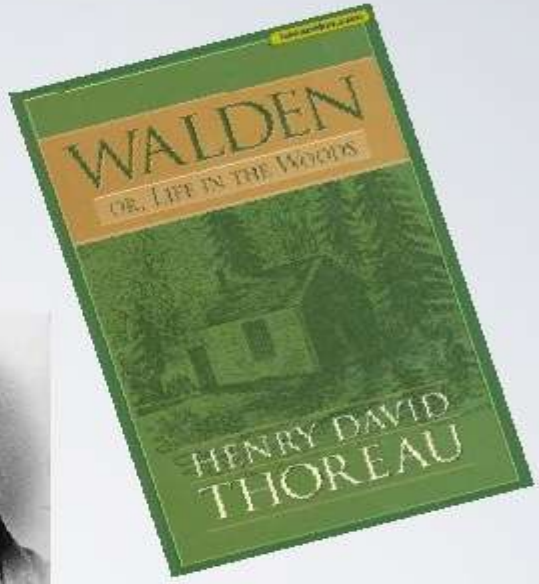
Make a timeline of the history of environmental science in America:

REQUIREMENT 1: ENVIRONMENTAL TIMELINE

THOMAS MALTHUS (1798)

Predicted that exponential population growth would outpace linear food production, which leads to starvation

REQUIREMENT 1: TIMELINE



HENRY DAVID THOREAU (1845)

Believed in being simple and self sufficient. Author of Walden or, Life in the Woods

REQUIREMENT 1: TIMELINE

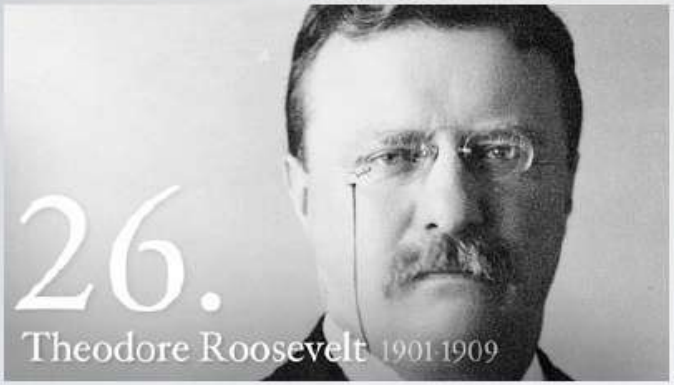
REQUIREMENT 1: TIMELINE

REQUIREMENT 1: TIMELINE

LACEY ACT (1900)

The Lacy Act simply stated that you can't kill birds without paying the state

REQUIREMENT 1: TIMELINE



THEODORE ROOSEVELT (1901-1909)

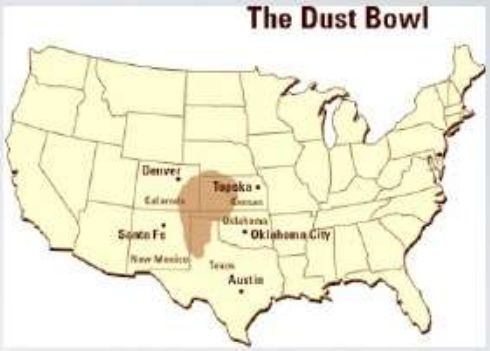
A conservationist who was the 1st Environmental President. He started the Golden Age of Conservation.

REQUIREMENT 1: TIMELINE

FOREST SERVICE (1905)

Pinchot believed in using the forests, but also protecting them for future generations, utilizing the resources wisely. The Forest Service is used to administer the national forests.

REQUIREMENT 1: TIMELINE



DUST BOWL (1934-1940)

A drought occurred, and the citizens used bad farming techniques which led to the soil depleting and starvation.

REQUIREMENT 1: TIMELINE

SILENT SPRING (1962)

Rachel Carson cautioned about pesticides, and DDT. She is the mother of the Environmental Science movement.

REQUIREMENT 1: TIMELINE

CUYAHOGA RIVER FIRE (1969)

The river was so badly polluted it caught on fire

REQUIREMENT 1: TIMELINE

NATIONAL ENVIRONMENTAL POLICY ACT (1969)

1st comprehensive Environmental Law. No construction if it negatively affects the environment.

REQUIREMENT 1: TIMELINE

REQUIREMENT 1: TIMELINE

EPA ESTABLISHED (1970)

Nixon established the EPA

REQUIREMENT 1: TIMELINE

FIRST EARTH DAY (1970)

April 22nd. The First Earth Day was arranged by students universities and such.

REQUIREMENT 1: TIMELINE

CLEAN WATER ACT (1972)

Regulated pollution in water, it sets maximum limits in drinkable water.

REQUIREMENT 1: TIMELINE

THREE MILE ISLAND (1979)

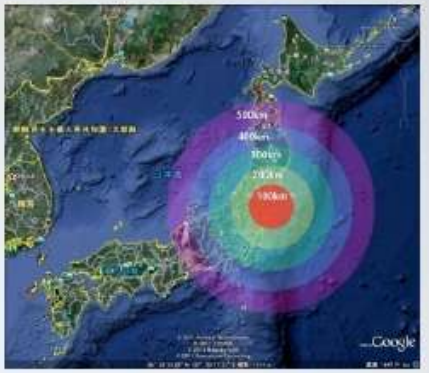
Located in Pennsylvania, it was the worst nuclear disaster of all time

REQUIREMENT 1: TIMELINE

EXXON VALDEZ (1989)

One of the worst disasters that occurred at sea. An oil tanker struck a reef spilling millions of gallons into the ocean.

REQUIREMENT 1: TIMELINE



FUKUSHIMA, JAPAN (2011)

Huge radiation triggered after a nuclear reactor exploded due to an earthquake that triggered a tsunami.

BSA CONTRIBUTION TO ENVIRONMENTAL SCIENCE

- **1910**
  - The Boy Scouts of America was incorporated
- **1914**
  - First tree-planting project was held in New York
  - Planted 12,000 Boy Scout war gardens
- **1938**
  - Philturn Rocky Mountain Scout Camp established
    - 35,857 acres of land near Cimarron, New Mexico (conservation)
- **1940-1949**
  - Philmont Scout Ranch established
    - Additional gift from Waite Phillips, 1941
    - Contiguous to former Philturn Rocky Mountain Scout Camp
    - Total combined acreage: 127,000
  - Councils and campsites by 1949
    - 543 councils
    - 831 campsites
    - 288,545 acres
- **1970-1979**
  - Scouting Keep America Beautiful Day
    - June 5, 1971
    - Scouts collected more than a million tons of litter
- **1980-1989**
  - First Scouting for Food National Good Turn, 1988
    - More than 60 million food items were collected
- **2000-2009**
  - ArrowCorps5, 2008
    - In cooperation with the U.S. Forest Service
    - 3,600 Scouts and adult volunteers participated
    - $5.6 million worth of improvements made to national parks
  - The Summit Bechtel Family National Scout Reserve, 2009
- **Present Day**
  - Thousands of Eagle Scout projects, service days, etc

BSA CONTRIBUTION TO ENVIRONMENTAL SCIENCE

Outdoor Code

As an American, I will do my best to
Be clean in my outdoor manners,
Be careful with fire,
Be considerate in the outdoors, and
Be conservation-minded.

BSA CONTRIBUTION TO ENVIRONMENTAL SCIENCE

Leave No Trace

Plan ahead and Prepare
Travel and camp on durable surfaces
Dispose of water properly
Leave what you find
Minimize campfire impacts
Respect wildlife
Be considerate of other visitors

BSA CONTRIBUTION TO ENVIRONMENTAL SCIENCE

- Nature study is the key activity in Scouting.
- The aim in Nature study is to develop a realization of God the Creator, and to infuse a sense of the beauty of Nature."

BSA CONTRIBUTION TO ENVIRONMENTAL SCIENCE

- Met Lord Baden-Powell in 1906 and shared ideas
- LBP read Seton's book *The Birch Bark Roll of the Woodcraft Indians*
- Early fascination with wolves. Hunted Lobo in New Mexico
- Co-founded BSA through merger of YMCA, Sons of Daniel Boone, and Woodcraft Indians in 1910
- Seton's work is in large part responsible for the American Indian influences in the BSA
- One of America's earliest and most influential conservationists

2. DEFINE TERMS

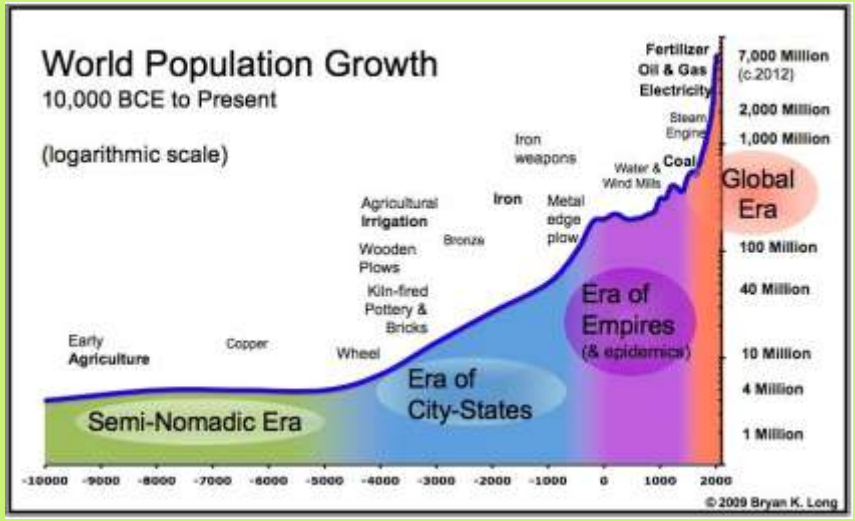
Define the following terms in your workbook:

ENVIRONMENTAL SCIENCE TERMS

- Population
- Community
- Ecosystem
- Biosphere
- Symbiosis
- Niche
- Habitat
- Conservation
- Threatened species
- Endangered species
- Extinction
- Pollution prevention
- Brownfield
- Ozone
- Watershed
- Airshed
- Nonpoint source
- Hybrid vehicle
- Fuel cell

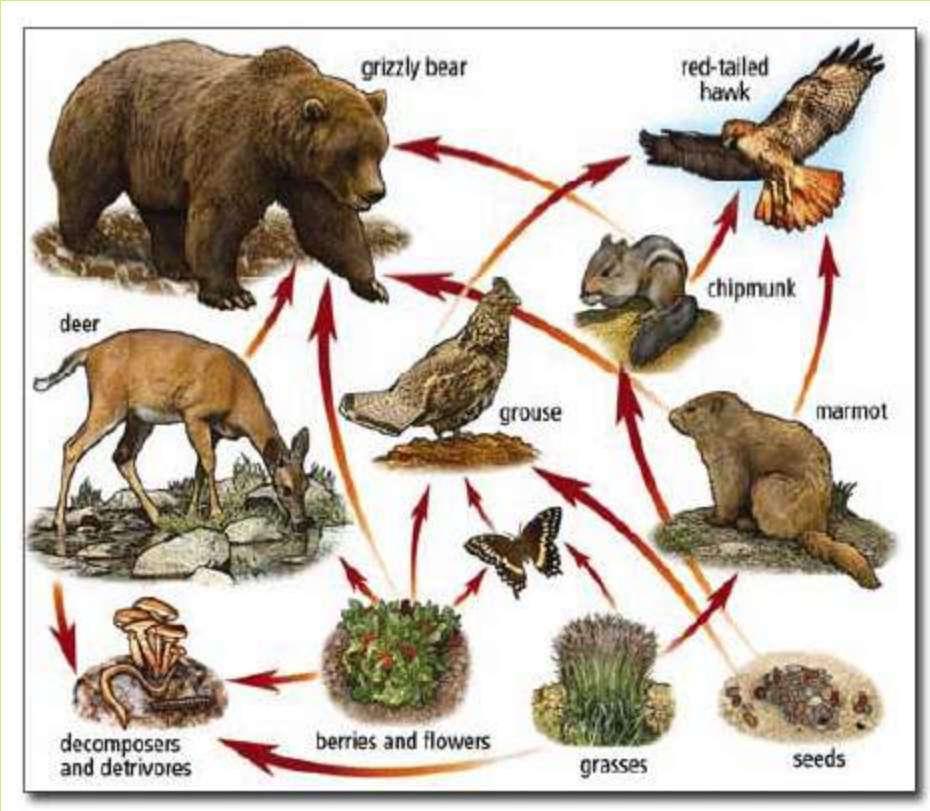
2: POPULATION

- A *population* is all the organisms of the same group or species who live in the same geographical area and are capable of interbreeding



2. COMMUNITY

- A community is a group of interacting living organisms sharing a populated environment.

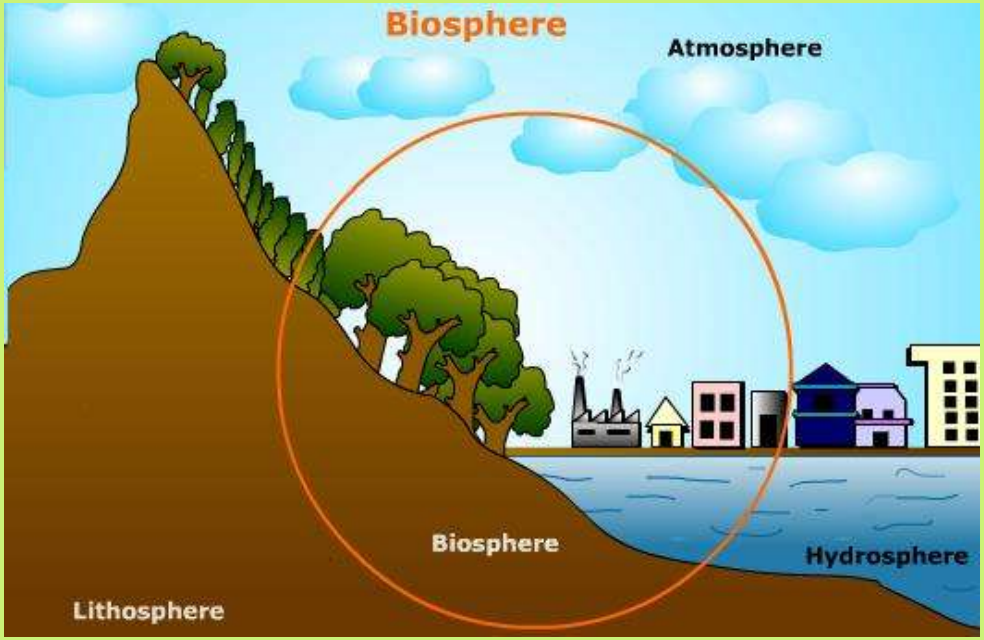


2. ECOSYSTEM

- An *ecosystem* is a community of living organisms (plants, animals and microbes) in conjunction with the nonliving components of their environment

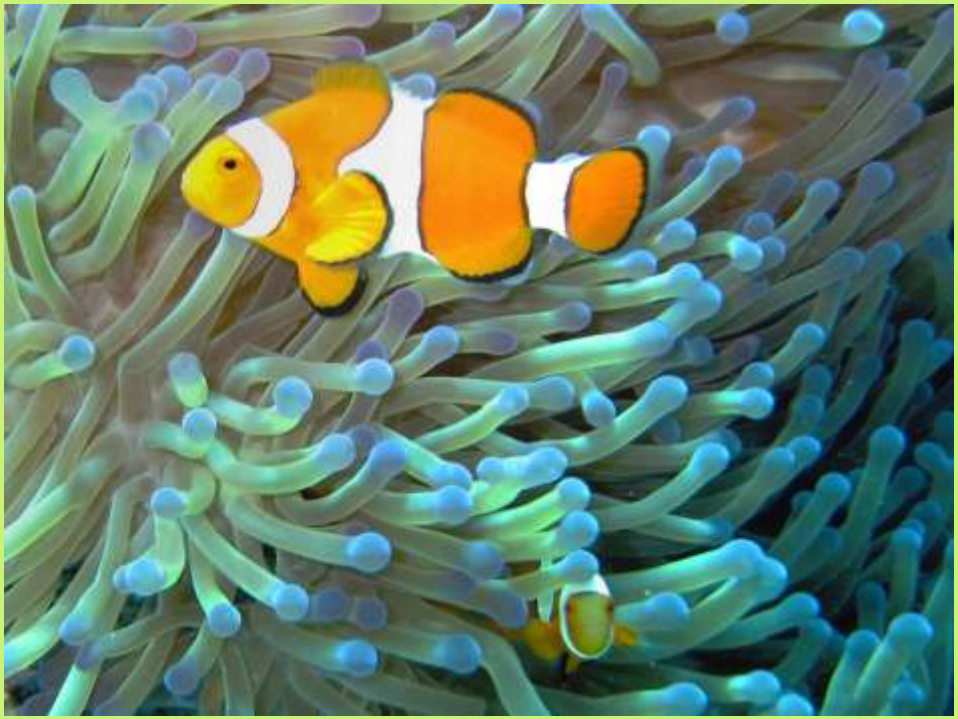
2. BIOSPHERE

- The part of the earth and its atmosphere in which living organisms exist or that is capable of supporting life



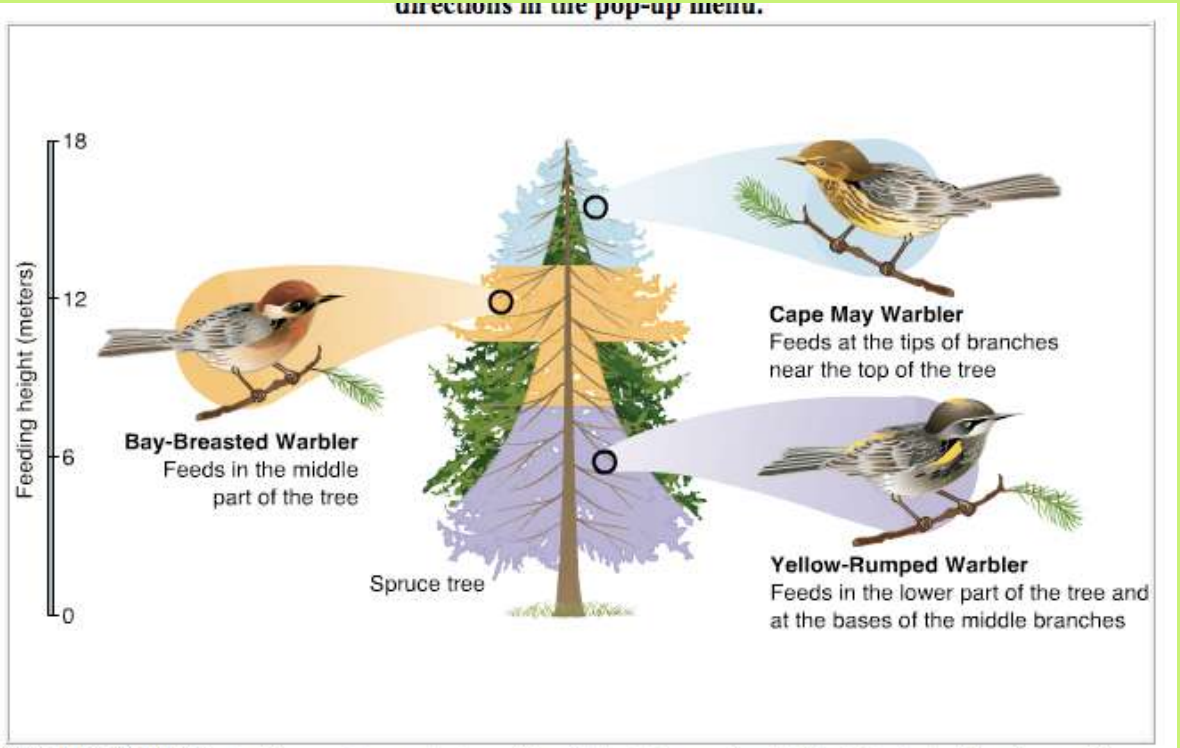
2. SYMBIOSIS

A close and often long-term interaction between two or more different biological species.



2. NICHE

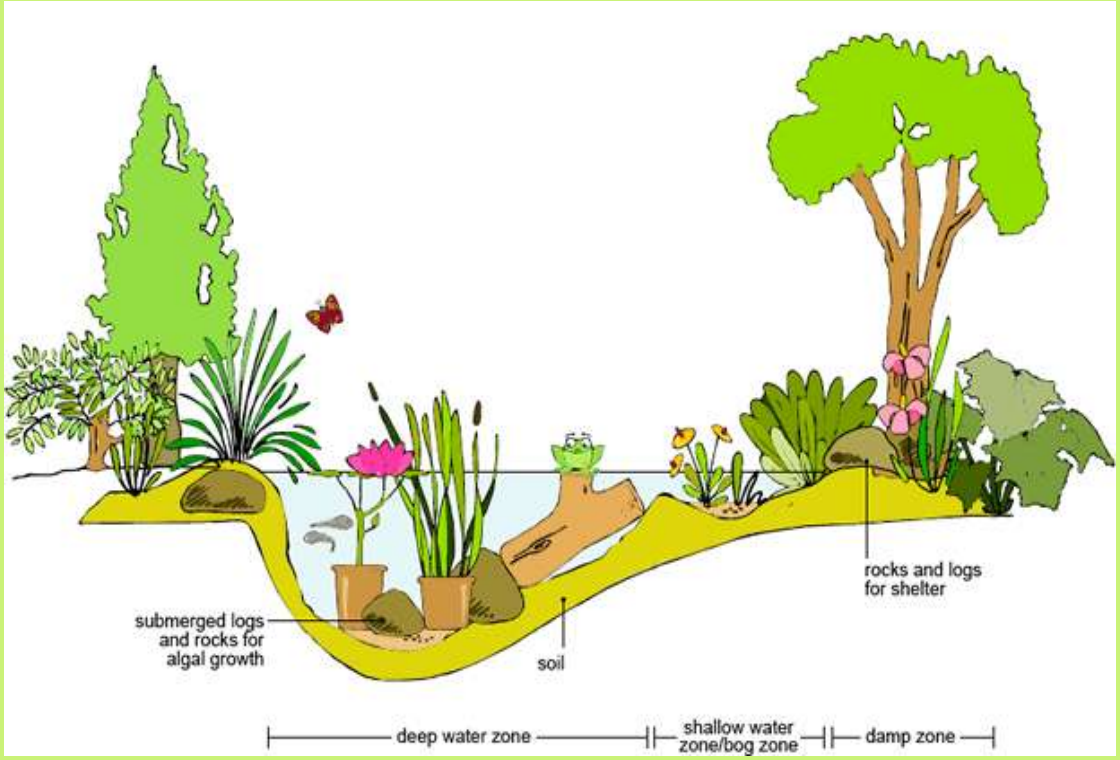
- The way of life of a species.



Warbler Niches Each of these warbler species has a different niche in its spruce tree habitat. By feeding in different areas of the tree, the birds avoid competing with one another for food. **Inferring** ***What would happen if two of the warbler species attempted to occupy the same niche?***

2. HABITAT

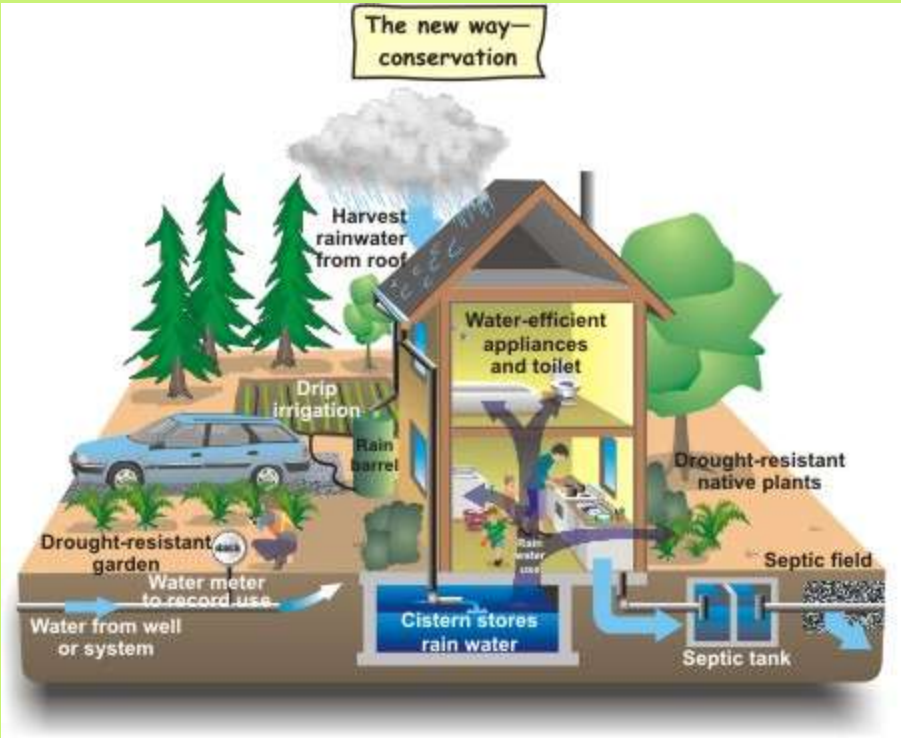
An ecological or environmental area that is inhabited by a particular species of
animal, plant, or other type of organism.



Environmental Science Merit Badge

2. CONSERVATION

Practices that protect animals, plants and the environment.



2. THREATENED SPECIES

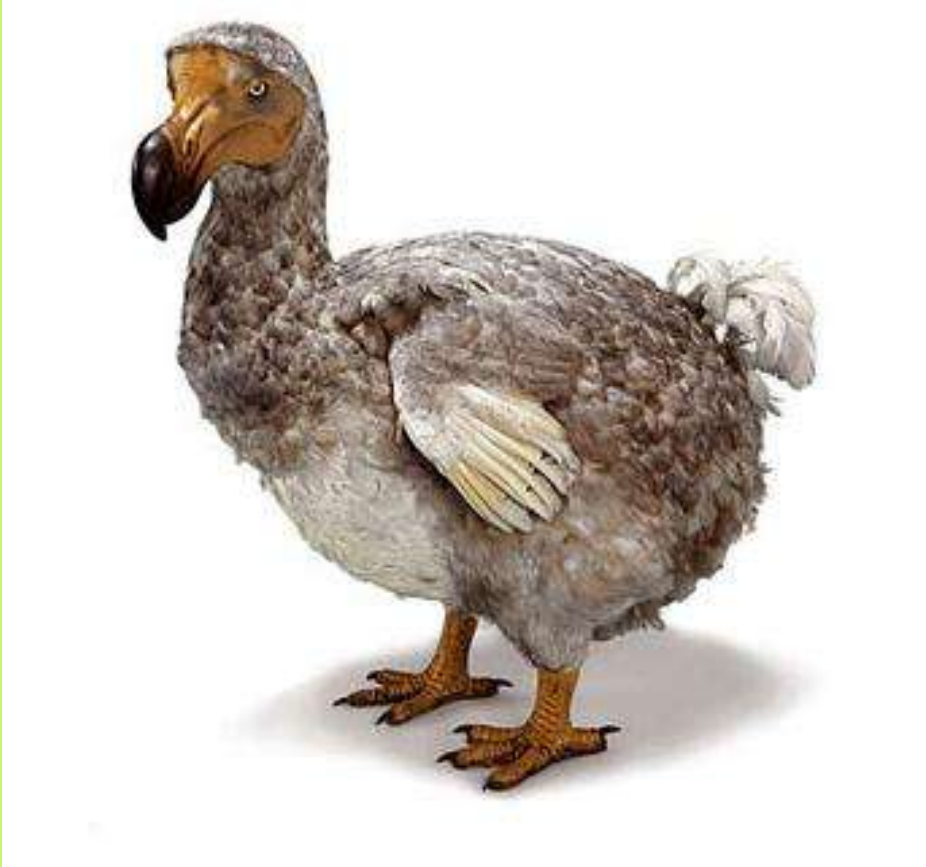
Any species (including animals, plants, fungi, etc.) which are vulnerable to endangerment in the near future

2. ENDANGERED SPECIES

An animal or plant *species* in danger of extinction throughout all or a significant portion of its range

2. EXTINCTION

The end of an organism or of a group of organisms (taxon), normally a species.



2. POLLUTION PREVENTION

Activities that reduce the amount of pollution generated by a process, whether it is consumer consumption, driving, or industrial production

2. BROWNFIELD

Brownfield sites are abandoned or underused industrial and commercial facilities available for re-use.

2. OZONE

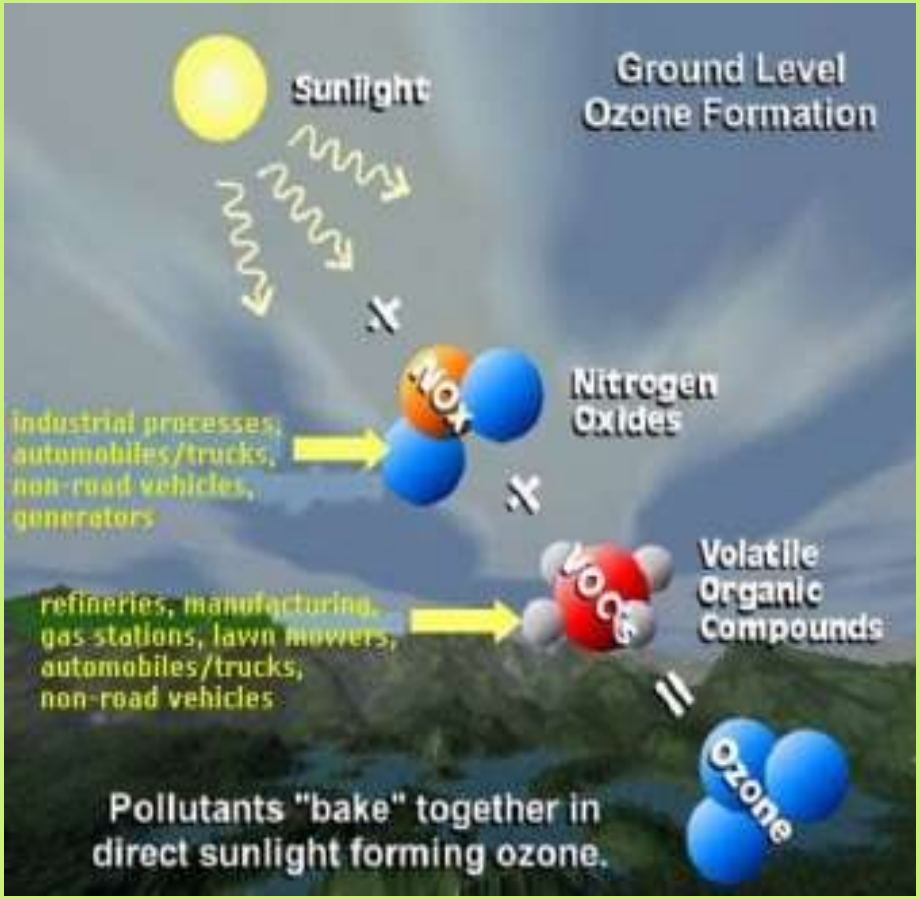
Atmospheric Ozone is produced when ultraviolet radiation interacts in the stratosphere.

Ozone in the atmosphere is naturally produced and destroyed at a constant rate.

Ozone protects the earth from harmful UV radiation which damages skin, eyes, and the immune system of life forms.

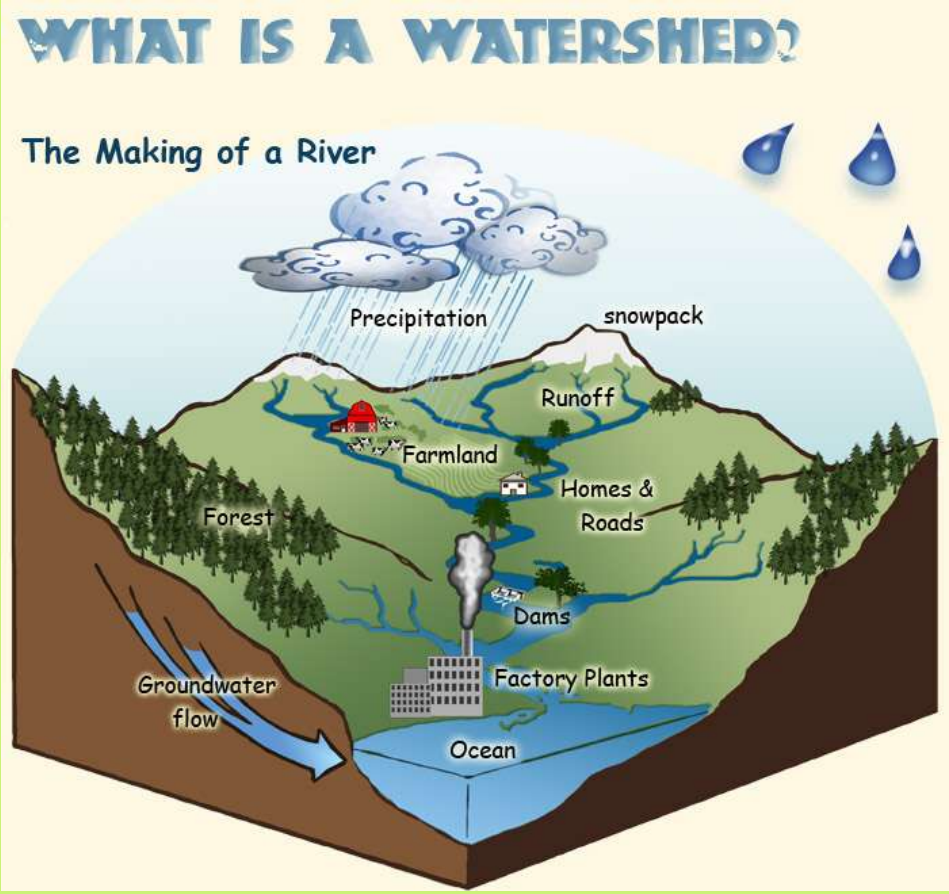
Ozone makes life on earth possible.

Ground-level Ozone is a major pollutant and green house gas.



2. WATERSHED

A *watershed* is the area of land where all of the water that is under it or drains off of it goes into the same place.



2. AIRSHED

An area within which the air frequently is confined or channeled, with all parts of the area being subject to similar conditions of air pollution.

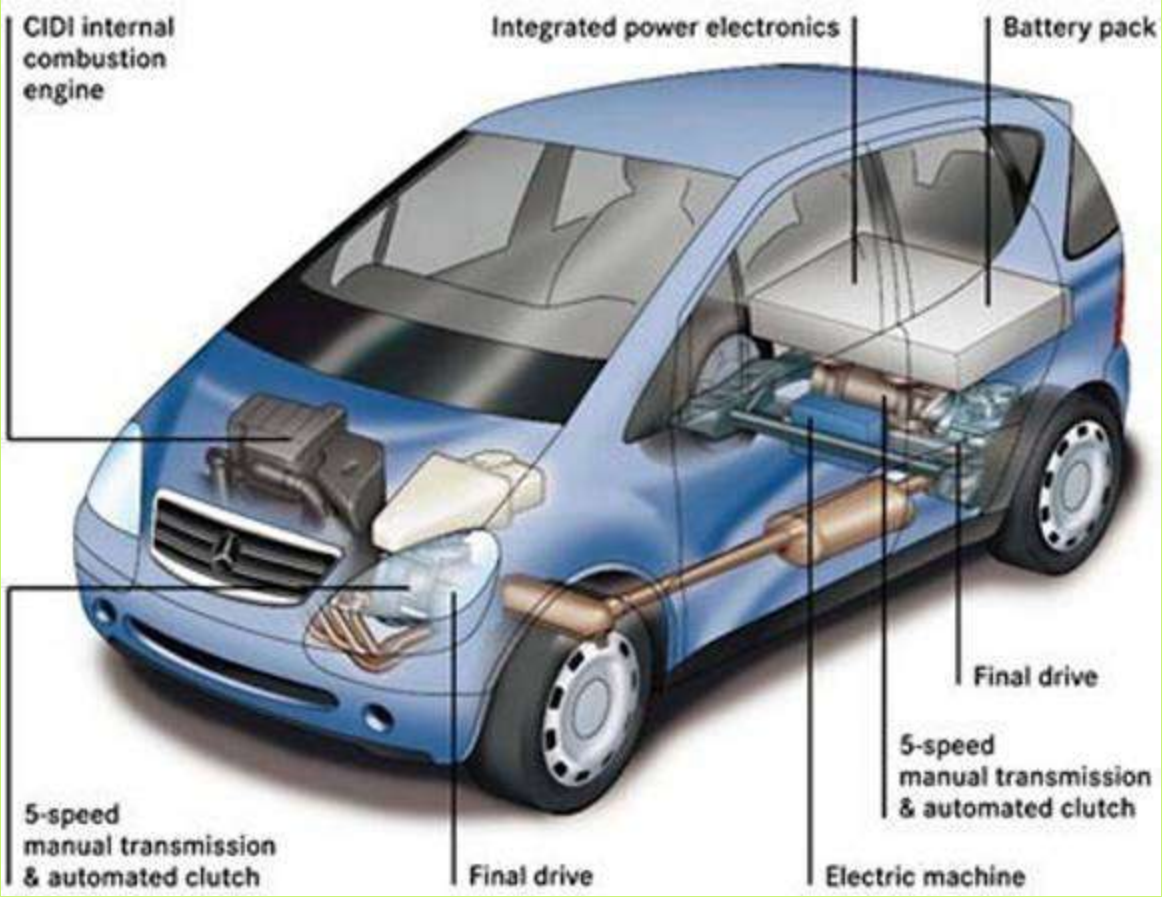
2. NONPOINT SOURCE

Nonpoint source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources.

Environmental Science Merit Badge

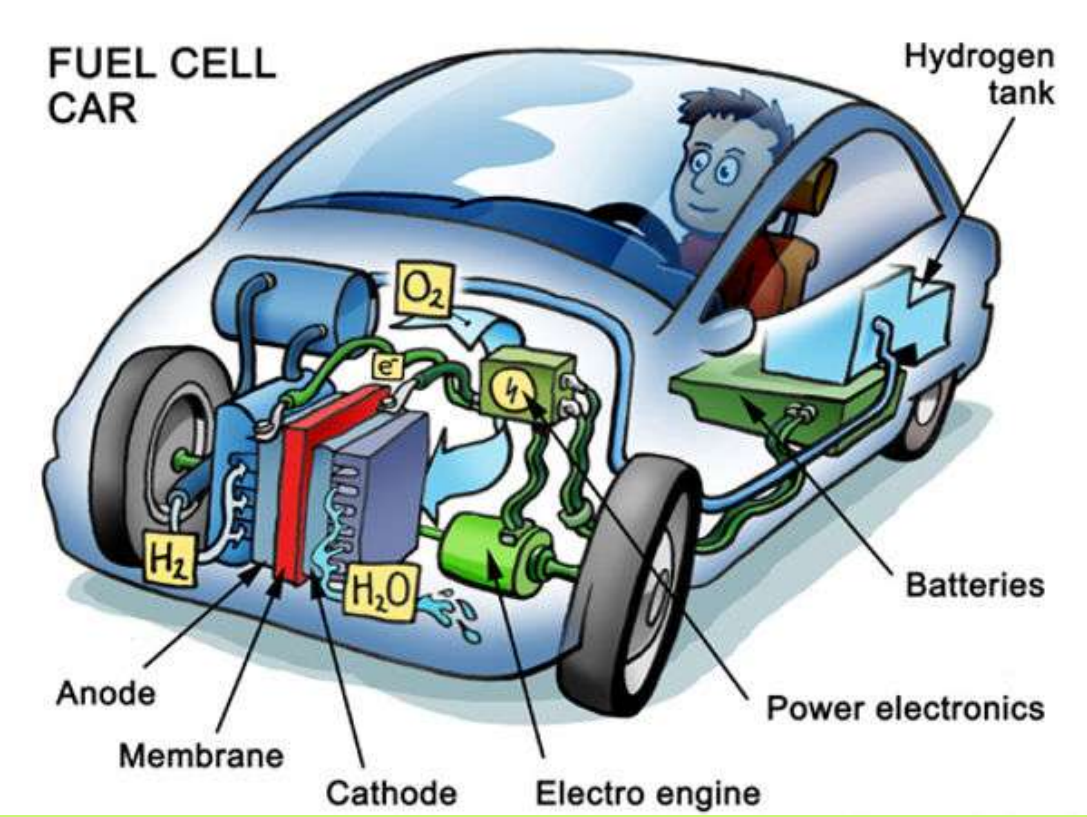
2. HYBRID VEHICLE

A vehicle that uses two or more distinct power sources to move the vehicle.



2. FUEL CELL

A device that converts the chemical energy from a fuel into electricity through a chemical reaction with oxygen or another oxidizing agent.

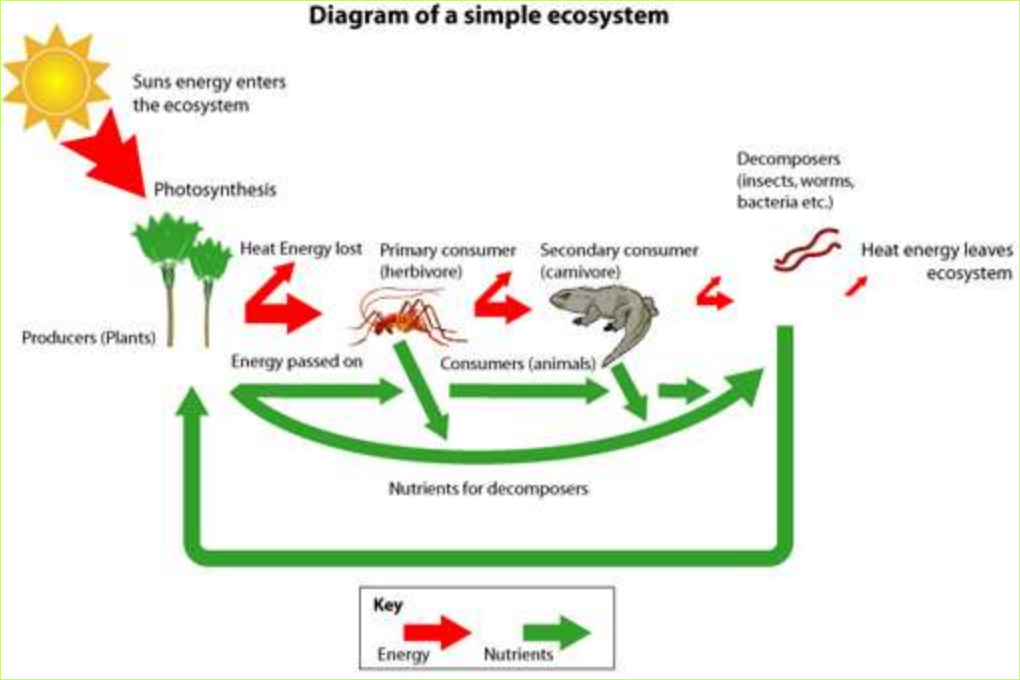


3. A. ECOLOGY

Describe An Ecosystem in your workbook

WHAT IS AN ECOSYSTEM?

An ecosystem is a community of living organisms (plants, animals and microbes) in conjunction with the nonliving components of their environment.



DESCRIBE AN ECOSYSTEM *UTAH LAKE

Environmental Science Merit Badge

DESCRIBE AN ECOSYSTEM UTAH LAKE

There have been four species of amphibia, twelve species of reptiles, thirteen species of fish, 152 species of birds, and forty-two species of mammals found in the environs of Utah Lake. The dumping of raw sewage, destruction of natural habit, hunting, and the introduction of non-native fish species have taken a toll on the native species in and around the lake.

Some of the mammals that live around the lake are the big brown bat, the silver-haired bat, mule deer, Botta's pocket gopher, desert woodrat, and striped skunk. There are seventeen known native mollusca to Utah Lake. Only three were reported in the lake ecosystem in 1969, and one species is extinct. The last living example of the freshwater snail Thickshell pondsnail (*Stagnicola utahensis*) was reportedly seen in the early 1930s. Four specimens were sent to the Smithsonian Institution in 1911 and the only known location for the snail was Utah Lake.[53]

Birds

About 226 species of birds use the lake either as their permanent home or as a stop over on their migration. The Utah Lake Wetland Preserve has been established at the south end of Utah Lake. It contains two units, one at Goshen bay with more than 21,750 acres (88.0 km^2) of land preserved, and another unit at Benjamin Slough.[54] Birds seen at Utah Lake include sandhill crane, double-crested cormorant, great horned owl, turkey vulture, golden eagle, cinnamon teal duck, and mallard duck.[55]

Fish[1]

At least 25 species of fish have been introduced into Utah Lake's waters. Carp, white bass, black bullhead, channel catfish, Walleye, goldfish, yellow perch, blue gill, and black crappie are found in abundance.[59] The golden shiner and the fathead minnow are rarely found. Of the thirteen species of fish native to Utah Lake, the Utah Lake sculpin is extinct, the least chub and the June Sucker are endangered and the Utah sucker is found in abunance. All other native fish are no longer extant in the lake.

DESCRIBE AN ECOSYSTEM
UTAH LAKE

The Common carp is the dominant species of fish in the lake. The common carp was introduced in 1883 as a source of food after native species had been depleted by overfishing. It is now the most prevalent fish found in Utah Lake. Carp makes up about 90% of the lake's biomass, with an adult population numbering around 7.5 million. The average carp in the lake is about 5.3 pounds (2.4 kg), for a total of nearly 40,000,000 pounds (18,000,000 kg) of carp in the lake.

As early as 1901, fish and wildlife representatives noted that carp were causing the trout population in the lake to collapse. Due to their habit of grubbing through bottom sediments for food, carp stir up sediments and increase the turbidity of the water. In addition, they destroy submerged vegetation that holds sediments in place and provides shelter for native fish populations. Without vegetation, winds can more easily stir up sediment from the bottom of the lake, which is already a problem due to the lake's shallowness, resulting in greater turbidity and less sunlight reaching the remaining vegetation. Without cover for their young, native fish, such as the June sucker, become easy prey for white bass, walleye, carp, and other predators.

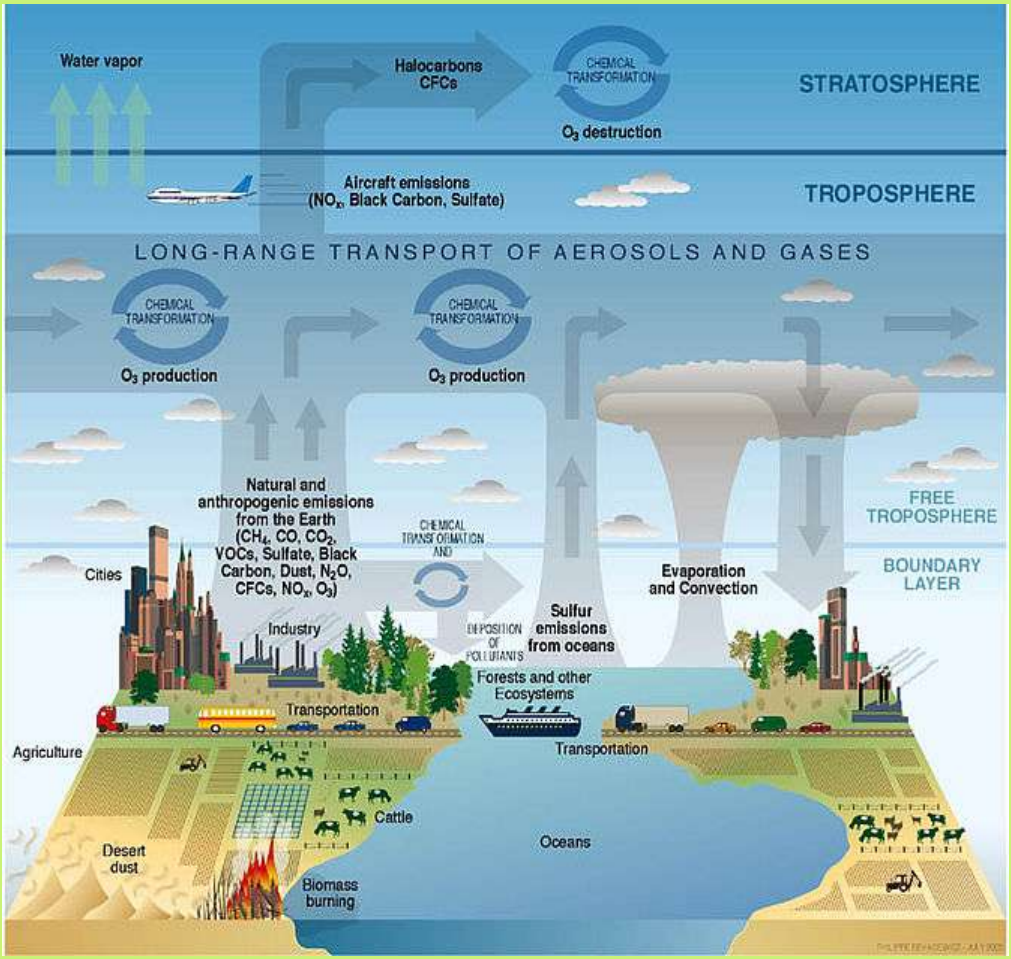
Efforts are underway to reduce the population of carp in Utah Lake by employing local commercial fishermen, led by Bill Loy, Jr. to remove 5 million pounds of carp each year, as part of the June Sucker Recovery Implementation Program's efforts to restore Utah Lake to a habitat in which the June Sucker can survive. The intent is to cause a crash in the carp population which will allow the ecosystem to begin to rebuild and the June sucker to reestablish dominance in the lake.

3.B. AIR POLLUTION

Explain Acid Rain in your workbook

3.B. AIR POLLUTION

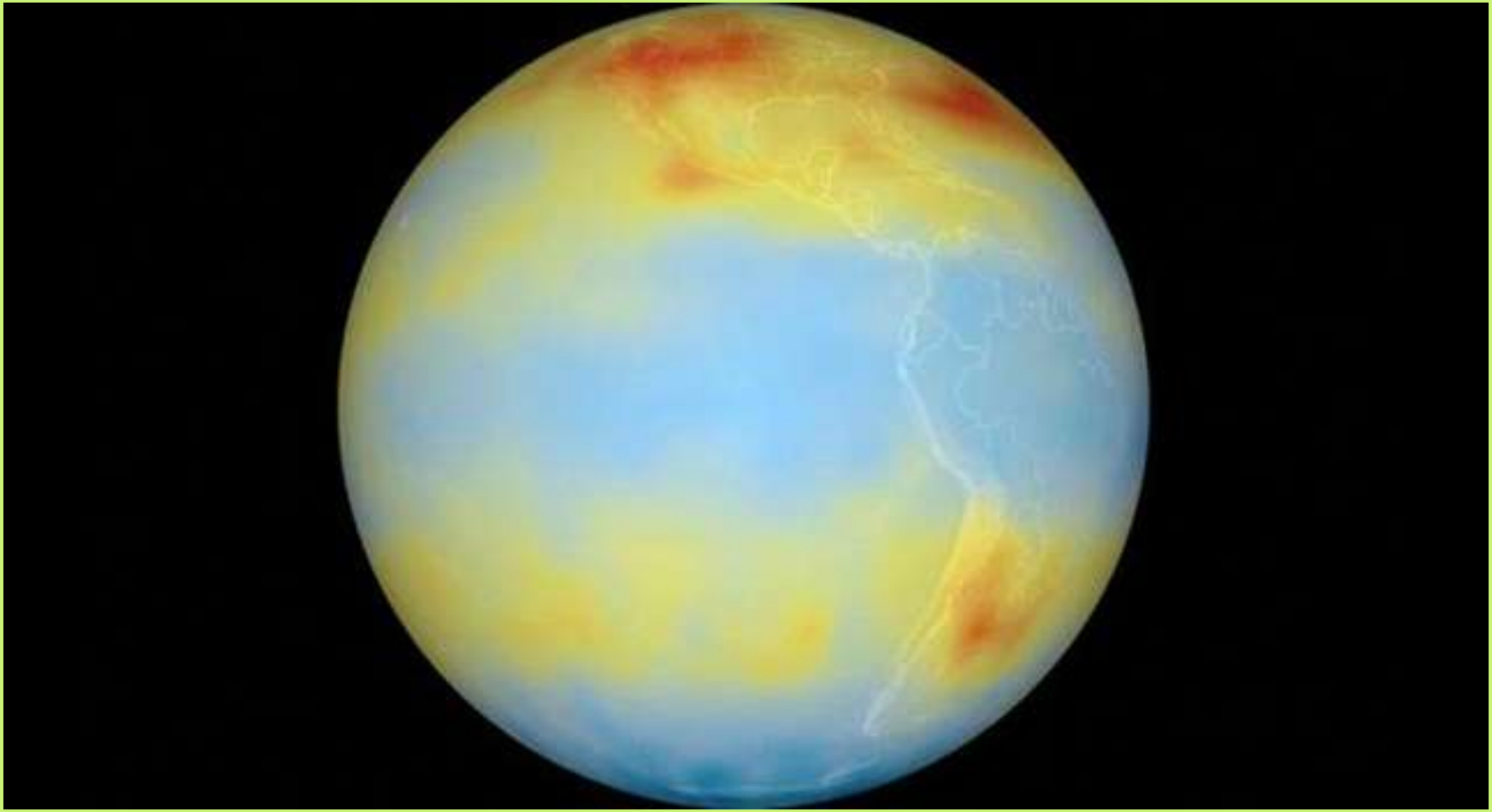
- Air is made up of nitrogen (78%) and oxygen (21%). The rest is carbon dioxide, argon, and trace amounts of chlorofluorocarons.
- Water vapor concentrations vary and are called humidity.
- Most of the earth's air is in the inner-most layer of the atmosphere, called the troposphere.



3.B. AIR POLLUTION

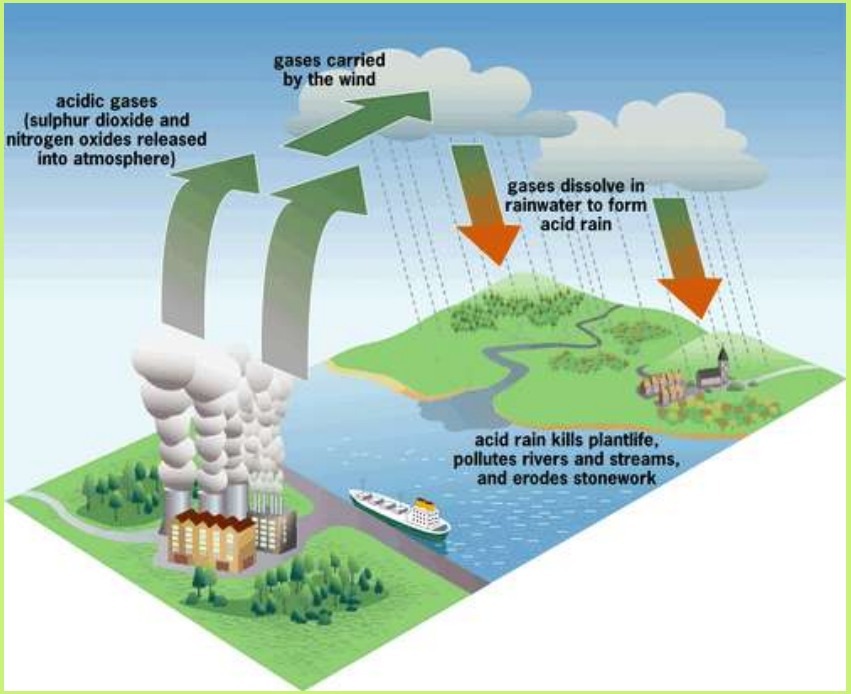
- Air pollution may occur naturally or may be caused by human activities
  - Natural air pollution comes from volcanoes, dust storms, and forest fires.
  - Most air pollution created by humans comes from burning fossil fuels (coal, oil, gasoline).

3.B. EARTH'S CARBON DIOXIDE AS SEEN FROM SPACE



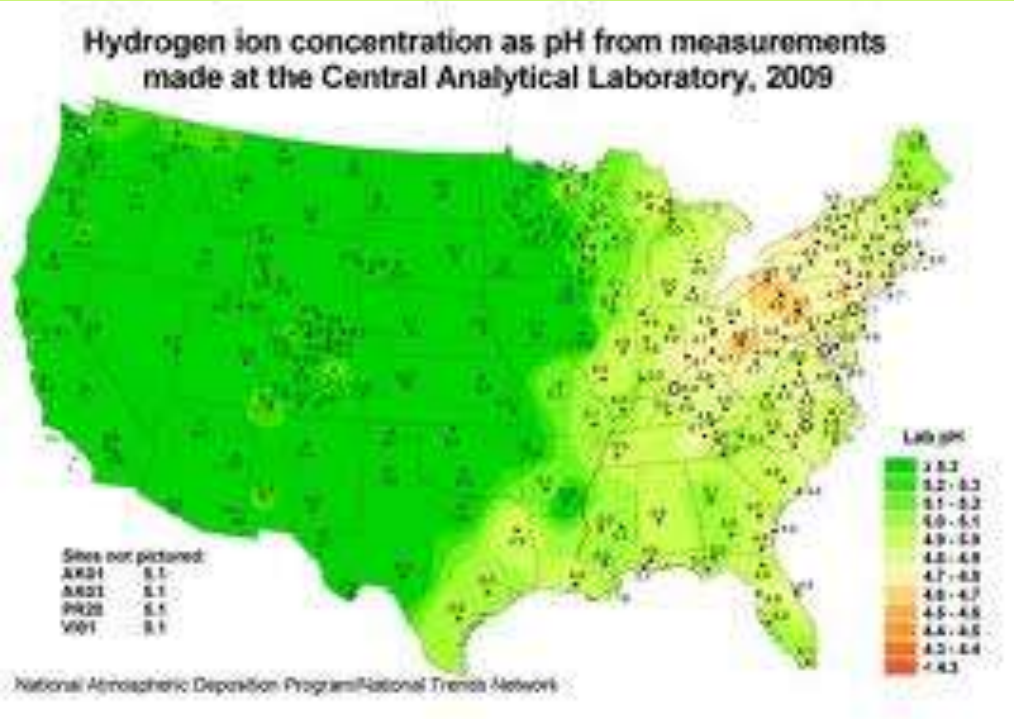
3.B. ACID RAIN

- Carbon dioxide in the air interacts with water vapor to form a weak acid called carbonic acid.
  - Normal rain has a pH of 7. Acid rain has a pH of about 5.6
- Sulfur dioxide and nitrogen oxides emitted from vehicles and power plants also mixes with water vapor to form acids in the atmosphere.



3.B. ACID RAIN (CONTINUED)

- Acid rain may cause an entire ecosystem to collapse.



3.B. ACID RAIN (CONTINUED)

- Plants may be weakened or killed by acid rain.

3.B. ACID RAIN (CONTINUED)

- Acid rain damages our homes, cemete[illegible] headstones, bui[illegible]s and statues.

3.C. WATER POLLUTION

Conduct an experiment to identify methods to reduce the effects of an oil spill on waterfowl

3.C. WATER POLLUTION OIL SPILL EXPERIMENT

- A major source of water pollution is oil and gasoline
- Oil spills at sea devastate ocean and coastal ecosystems
- Some organisms are killed directly by the oil while others die slowly

3.C. WATER POLLUTION OIL SPILL EXPERIMENT

- It takes many years for marine life to recover after an oil spill

3.C. WATER POLLUTION OIL SPILL EXPERIMENT

- Chemical dispersants "scatter" oil by breaking up the slick into small droplets

3.C. WATER POLLUTION OIL SPILL EXPERIMENT

- Hot water washing works best on heavily oiled rocky beaches
- Hot water also kills plants and animals
- Tarry oil below the surface may remain for decades

3.C. WATER POLLUTION
OIL SPILL EXPERIMENT (CONTINUED)

- Skimmers collect oil from the water's surface
- Heavy oil and tar may sink to the bottom and remain for decades

3.C. WATER POLLUTION
OIL SPILL EXPERIMENT (CONTINUED)

Experiment: Identify the methods that could be used to mediate the effects of an oil spill on waterfowl.

Materials:

- feathers
- motor oil
- water basins
- detergent (dispersant)
- solvent (cleaning solution)
- absorbant (kitty litter)
- brushes

Procedure: Put a few drops of motor oil on a feather. Try different means to remove the oil without damaging the feather.

3.C. WATER POLLUTION
OIL SPILL EXPERIMENT (CONTINUED)

- **Class discussion about the methods of cleaning birds and their possible flaws.**

- After students have tested all of the materials—ask:
  - *Did any method completely remove the oil?*
  - *What happened to the chemicals?*
  - *Do you think all toxins or chemicals behave the same way? Why or why not?*

- Have students compare their results for each cleaning material. Ask:
  - *Based on your observations, how effective do you think the wildfowl rescue efforts have been?*
  - *Did any of your observations change the way you view the cleanup strategies being used in the Gulf?*
  - *Did any of your observations change the way you view the effects cleanup strategies may have on the water quality and wildlife of the Gulf?*

3.D. LAND POLLUTION

Photograph an area affected by erosion. Discuss why the area has eroded and what might be done.

POLLUTION BY SEDIMENTATION

- Sediment is tiny particles of soil and undissolved solid material carried by water
  - Sediment clouds water, making it difficult for light to reach organisms and plants that require photosynthesis for energy production.
  - Sediment may also carry pesticides and toxic chemicals.

3.E. ENDANGERED SPECIES

Do research on one endangered species found in your state. Do a 100-word report in your workbook.

3.E. RESEARCH AN ENDANGERED SPECIES: UTAH'S JUNE SUCKER

Common Name
JUNE SUCKER

Scientific Name
CHASMISTES LIORUS

The June sucker, Chasmistes liorus, is very narrowly distributed, occurring naturally in Utah Lake and the Provo River, and nowhere else in the world. Although the species was once abundant in Utah Lake, it is now extremely rare. Major causes of the June sucker's decline include flow alterations, pollution, drought, hybridization with other sucker species, and competition with and predation from exotic fish species. The June sucker is Federally listed as endangered, and efforts to help recover the June sucker population are on-going.

Interestingly, although June suckers are members of the sucker family, they are not bottom feeders. The jaw structure of the June sucker allows the species to feed on zooplankton in the middle of the water column.

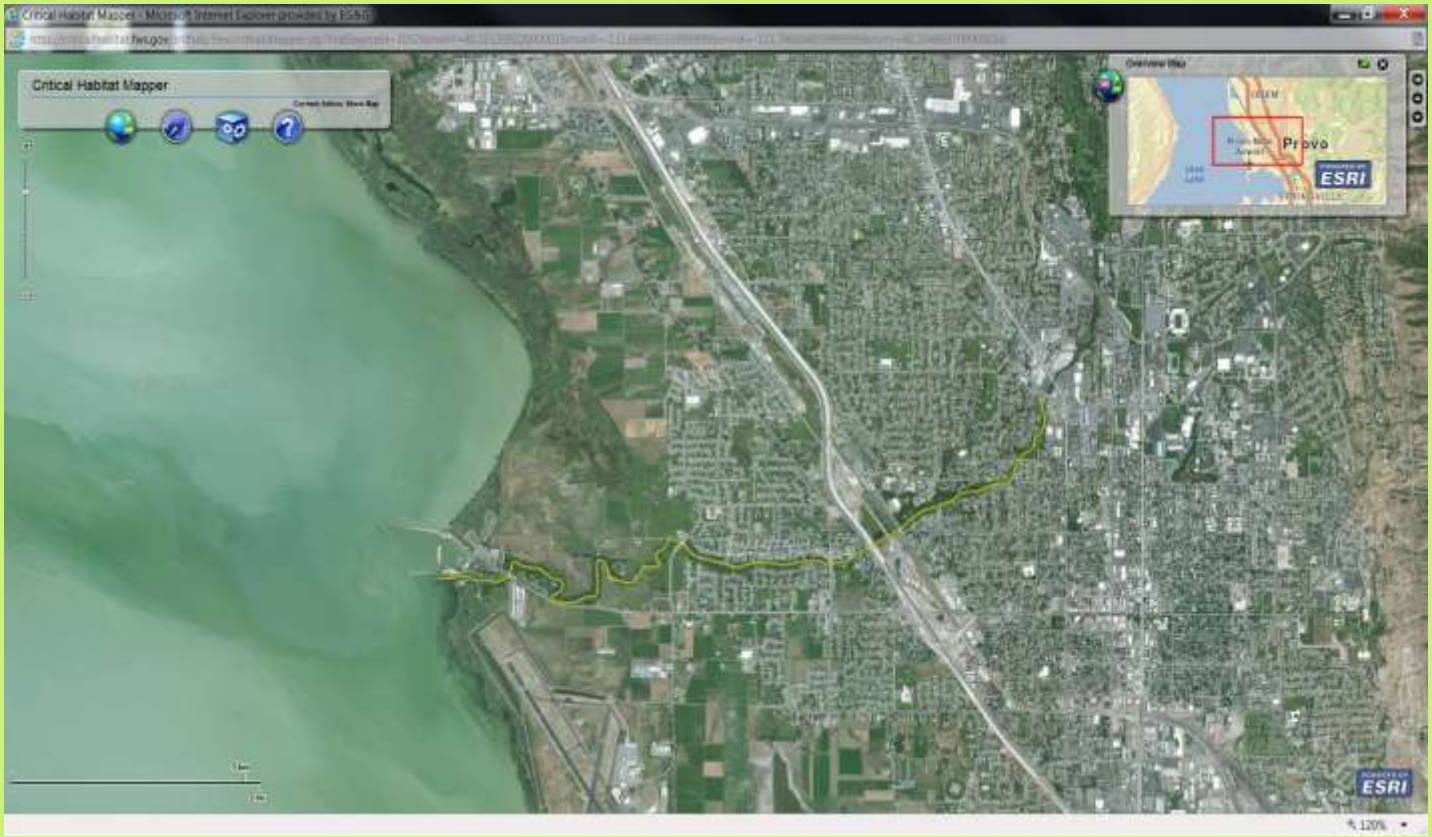
June sucker adults leave Utah Lake and swim up the Provo River to spawn in June of each year. Spawning occurs in shallow riffles over gravel or rock substrate. Fertilized eggs sink to the stream bottom, where they hatch in about four days. No parental care is given to eggs or young.

Sources:

Biotics Database. 2005. Utah Division of Wildlife Resources, NatureServe, and the network of Natural Heritage Programs and Conservation Data Centers.

Sigler, W. F. and J. W. Sigler. 1996. Fishes of Utah[:] a natural history. University of Utah Press. Salt Lake City. 375 pp.

3.E. RESEARCH AN ENDANGERED SPECIES: UTAH'S JUNE SUCKER



Fish and Wildlife Service Endangered Species List for Utah County
http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=49049

US FISH AND WILDLIFE RECOVERY PLAN FOR THE JUNE SUCKER

OBJECTIVE AND CRITERIA

The immediate objective of this recovery plan is to prevent extinction of the June sucker by establishing at least one secure refuge population and halting and reversing the decline ofthe extant population in Utah Lake. The second objective of this recoveryplan is to recover the species to a point where downlisting and delisting can be considered. The June sucker may be downlisted to threatened status when (1) Provo River flows essential for June sucker spawning and recruitment are protected, (2) habitat in the Provo River and Utah Lake has been enhanced and/or established to provide for the continued existence of all life stages, (3) normative species which present a significant threat to the continued existence of June sucker are reduced or eliminated from Utah Lake, and (4) an increasing self-sustaining spawning run ofwild June sucker resulting in significant recruitment over ten years has been re-established in the Provo River.

The June sucker may be delisted when the following interim criteria established for the delisting Of the June sucker are met: (1) establishment ofa second self-sustaining, protected, refugia population of June sucker within the Utah Lake Basin; and (2) establishment of an additional self-sustaining spawning run of June sucker in Utah Lake. This will require adequate protection Of instream flows and available habitat, as well as successful recruitment to the spawning run of June sucker naturally produced in the Lake; and (3) removal of other threats to the continued existence of June sucker including those associated with the required physical, chemical and biological environment of Utah Lake necessary for survival of the species. Final delisting criteria will be determined after an analysis to determine quantified objectives is completed including a definition of a self-sustaining June sucker population.

JUNE SUCKER ENVIRONMENTAL ASSESSMENT

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

Availability of a Draft Environmental Assessment for Federal Agency Participation in the June Sucker Recovery Implementation Program

ACTION: Notice of availability of a draft environmental assessment for Federal agency participation in the June Sucker recovery implementation program.

SUMMARY: This notice advises the public

that the Draft Environmental Assessment (DEA) for Federal agency participation in the June Sucker Recovery Implementation Program (Program) is available for public review and comment. The purpose of the proposed Federal action described in the DEA is to formally declare the intention of the Fish and Wildlife Service (Service), Bureau of Reclamation, Utah Reclamation Mitigation and Conservation Commission, and Interior to participate in the multi-agency program designed to implement recovery actions for the endangered June sucker. In addition to implementing recovery actions, the Program will facilitate resolution of conflicts associated with June sucker recovery in the Utah Lake and Provo River basins in Utah. Other participants include the State of Utah Department of Natural Resources, the Central Utah Water Conservancy District, Provo River Water Users Association, Provo Reservoir Water Users Company, and representation from an outdoor interest group. We are seeking comments from the public, other concerned governmental agencies, the scientific community, the environmental community, industry, and any other interested parties on this DEA.

DATES: We must receive comments on the DEA on or before December 13, 2001

to be considered.

ADDRESSES: Written comments should be addressed to the Field Supervisor, Utah Ecological Services Field Office, Lincoln Plaza, 145 East 1300 South, Suite 404, Salt Lake City, Utah 84115. Copies of the draft document are available via request to the Field Office. All comments and material received will be available upon request for public inspection, by appointment, during normal business hours at the above address. FOR FURTHER INFORMATION CONTACT: Mr. Henry Maddux, Utah Field Supervisor.

JUNE SUCKER ENVIRONMENTAL ASSESSMENT – NATURESERVE DATA

NatureServe Global Conservation Status Factors

Range Extent: 250-1000 square km (about 100-400 square miles)

Range Extent Comments: Native range includes Utah Lake (380 square kilometers) and the adjacent Provo River, Utah; flows in the Provo River are controlled by Deer Creek Reservoir and by agricultural diversions, which restrict spawning to 6.1 kilometers of the lowermost river (Scoppettone and Vinyard 1991). Refuge populations of the June sucker have been established in protected locations throughout Utah.

One reported specimen, collected from the Snake River below Jackson Lake Dam, Wyoming, represents another species, C. muriei, which is now presumably extinct (Miller and Smith 1981).

Number of Occurrences: 1 - 5

Number of Occurrences Comments: This species is represented by one occurrence (subpopulation).

Population Size: 250 - 1000 individuals

Population Size Comments: As of late 1980s, the adult population was believed to number about 1,000, apparently all of them over 15 years of age, with little or no recruitment (Matthews and Moseley 1990), due to high populations of non-native predatory fishes (USFWS 1990); total population was perhaps a few thousand (see Scoppettone and Vinyard 1991). In the late 1990s, wild adult population may have been close to 300 individuals (Keleher et al. 1998; C. Keleher, in Belk 1998). Most suckers captured during spawning runs in recent years have been captive-reared individuals.

Abundance of unhybridized C. liorus remains to be determined.

Number of Occurrences with Good Viability/Integrity: No (A- or B-ranked) occurrences with good viability

JUNE SUCKER ENVIRONMENTAL ASSESSMENT – NATURESERVE DATA

NatureServe Global Conservation Status Factors (continued)

Overall Threat Impact: Very high - high

Overall Threat Impact Comments: Decline of original population was due to pollution, drought, dewatering of habitat resulting from agricultural and domestic use of the Provo River, competition with and predation by introduced fishes, and damming of tributary streams (Miller and Smith 1981, Miller et al. 1989). Utah Lake now is operated as a reservoir, with extensively fluctuating water levels; it is increasingly euthrophic and saline, and introduced fishes (especially carp, also white bass, walleye, and black bullhead) have virtually replaced the native fauna (see Scoppettone and Vinyard 1991). These impacts have resulted in essentially no population recruitment (Belk 1998). Modde and Muirhead (1994) observed successful production of larvae in the late 1980s and concluded that recruitment failure is not due to reproductive failure.

Hybridization with Chasmistes ardens may have eliminated C. liorus as a distinctive species, but further study is needed.

Short-term Trend Comments: The wild adult population has declined greatly over the past three generations (roughly 50-75 years). Natural recruitment has not occurred in recent years (June Sucker Recovery Implementation Program, http://www.junesuckerrecovery.org/); without release of captive-reared suckers, the overall population would be declining to extinction.

Long-term Trend: Decline of >90%

Long-term Trend Comments: Population declined from millions in the early 1800s to fewer than 1,000 wild-spawned adults today (June Sucker Recovery Implementation Program, http://www.junesuckerrecovery.org/). USFWS (1990) categorized the status as "declining."

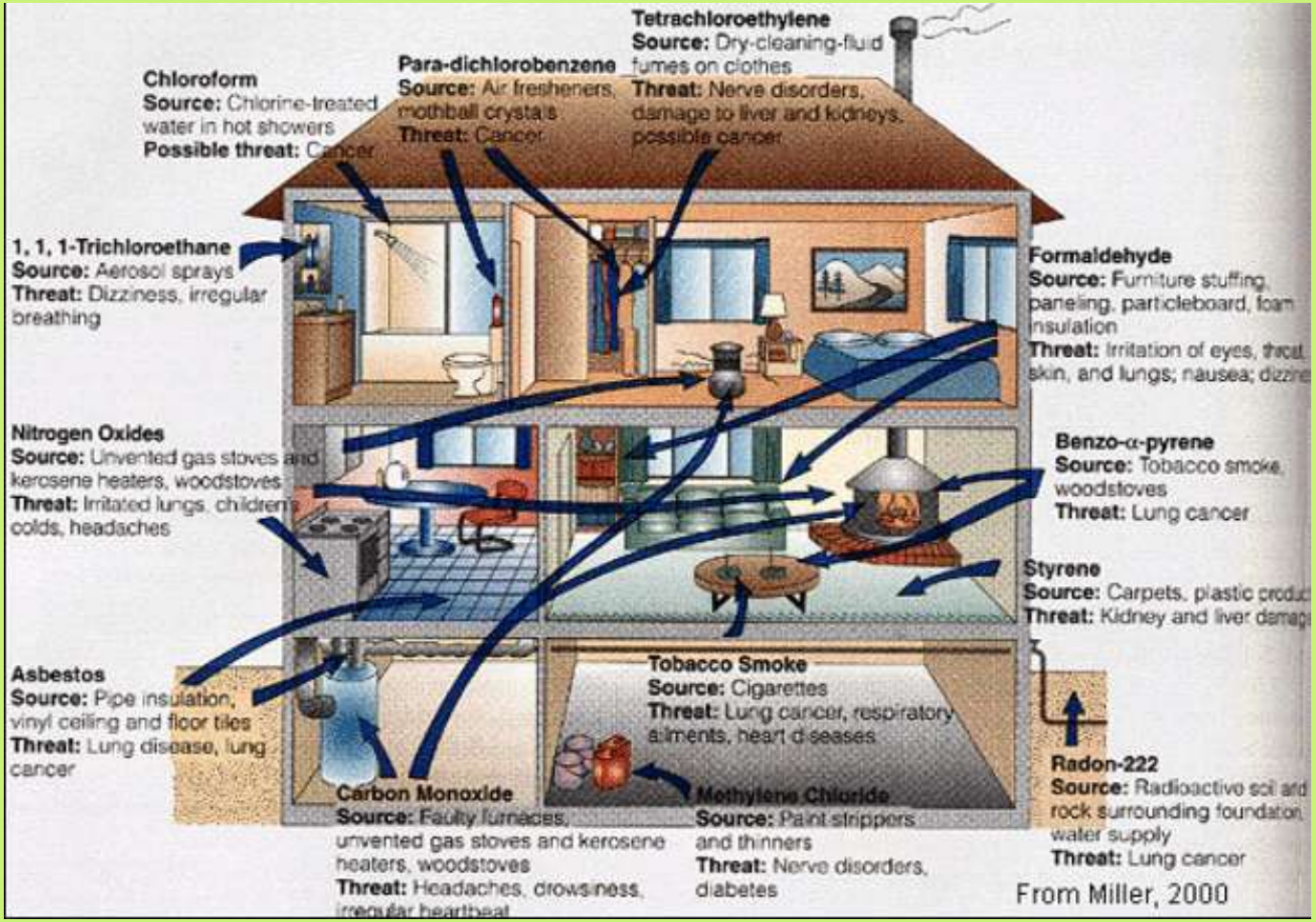
3.F. POLLUTION PREVENTION, RESOURCE RECOVERY AND CONSERVATION

Determine 10 ways your family can reduce pollution. Write them in your workbook.

3.F. HOUSEHOLD POLLUTANTS

- **What happens to the chemicals and solvents you use to clean your house?**
  - When you clean the toilet or bathtub, what happens to the chemicals that go down the drain?
  - If you live in a city, it goes to a water treatment plant where it is filtered and treated so it can be reused.
  - If you live in a rural area, it goes to your septic tank, then filters down into the soil
  - When this waste water contains toxic chemicals, the chemicals also enter the groundwater.

3.F. SOURCES OF HOUSEHOLD POLLUTION



3.F. TOXIC CHEMICALS

3.F. IDEAS FOR WAYS YOU CAN REDUCE POLLUTION

- Take the bus
- Use an electric lawnmower
- Turn off the garden hose when not in use
- Keep car tires properly inflated
- Wear a sweater in the winter
- Walk or ride a bike to school
- Pay bills online
- Use cloth napkins
- Use cloth kitchen towels
- Use bath towels more than once
- Wear clothes twice before laundering
- Insulate your house
- Turn up the Air Conditioner
- Turn down the furnace
- Use fluorescent light bulbs
- Replace shower heads with water conservation versions
- Don't use chemical fertilizers on your lawn
- Don't idle the car
- Drive the speed limit
- Use recycled paper
- Don't burn wood in the fireplace
- Don't burn leaves
- Keep furnace filters clean
- Carpool
- Use fabric/reusable shopping bags
- Recycle everything
- Give old stuff to DI rather than throwing it out
- Filter water; don't buy water in plastic bottles
- Turn off computers; don't leave them on standby
- Don't use aerosol sprays
- Take showers not baths
- Mulch lawnmower clippings

3.F. POLLUTION PREVENTION PROJECT

DETERMINE 10 WAYS YOUR FAMILY CAN REDUCE POLLUTION. PRACTICE 2 UNTIL WE MEET AGAIN.

	Pollution Prevention Project Worksheet						
		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Method 1	**#1**						
Method 2	#2						
Method 3	**#3**						
Method 4	#4						
Method 5	#5						
Method 6	#6						
Method 7	#7						
Method 8	#8						
Method 9	#8						
Method 10	#10						

4.A. OUTDOOR STUDY AREA ACTIVITY

Count the number of species, estimate space required, identify non-plant species

STUDY AREA REQUIREMENTS

- Two study areas
  - Very different from each other
  - 4 square yards each

REQUIREMENT 1.

- Count the number of species
- Estimate how much space is occupied by each species
- Identify any animals, insects, etc
- WRITE A REPORT about biodiversity and population density

REQUIREMENT 2.

- Visit each study area at least 3 times (6 total visits)
- KEEP A JOURNAL
- WRITE A REPORT about your observations and describe the differences you observe over time

5. ENVIRONMENTAL IMPACT STATEMENT

Items needed in an EIS for a construction project.

EIS PROCEDURE

Step 1 – Describe a Construction project in your notebook

Step 2 – Visit the site and record:

1. Plants and animals
2. Ecosystem description
3. Disturbed/undisturbed
4. Habitats of endangered species
5. Slope and erosion
6. Streams and wetlands
7. Fossils or artifacts
8. Activities next to the site

- Step 3 – Describe how the project fits existing plans in the area
- Step 4 – How will the project affect the environment?
  - Erosion?
  - Disturb ecosystems?
  - Disturb endangered species?
- Step 5 – Identify harmful aspects
- Step 6 – Suggest alternatives
- Step 7 – Discuss trade-offs
- Step 8 – How would other uses of the site be prevented
- Conclusions
  - Tell your Counselor what should be included in an EIS.
  - Should the project go ahead or be stopped?
  - What are viable alternatives?

6. CAREER OPPORTUNITIES

Find out about three career opportunities in environmental science

ENVIRONMETAL SCIENCE CAREERS

ENVIRONMETAL SCIENCE CAREERS

Environmental Science Merit Badge

ENVIRONMETAL SCIENCE CAREERS

Environmental Science Merit Badge

http://joelhebdon.wix.com/vanilla-partners#

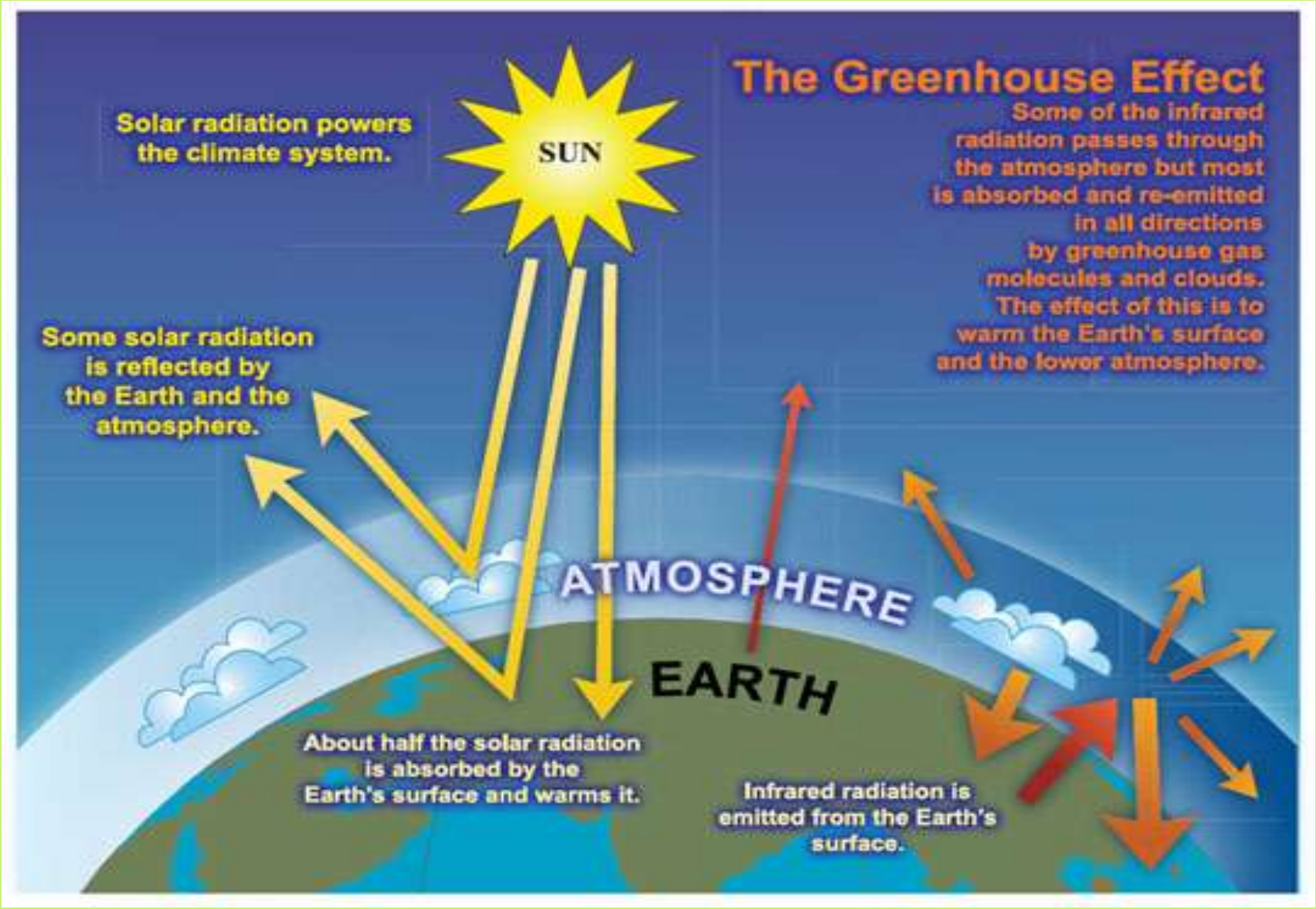
SUPPLEMENTAL SLIDES

THE GREENHOUSE EFFECT

- The earth's temperature is regulated by carbon dioxide, water vapor, and small amounts of ozone, methane and other gases in the atmosphere.
- Gases in the atmosphere let heat from the sun warm the atmosphere and trap some of it to heat the earth.

GLOBAL WARMING

- "Greenhouse gases" in the atmosphere have been steadily rising.
- Carbon dioxide is a major greenhouse gas.
- Methane emitted y animals (cattle, sheep, termites) is also a major greenhouse gas.
  - Methane traps about 25 times as much heat as carbon dioxide.


The Greenhouse Effect
Solar radiation powers the climate system.
SUN
Some of the infrared radiation passes through the atmosphere but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth's surface and the lower atmosphere.
Some solar radiation is reflected by the Earth and the atmosphere.
ATMOSPHERE
EARTH
About half the solar radiation is absorbed by the Earth's surface and warms it.
Infrared radiation is emitted from the Earth's surface.

GLOBAL WARMING

- In the last 100 years the average earth temperature has risen by 0.7 to 1.3 degrees.

- Consequences of this warming include rising sea levels, melting polar ice caps, “desertification”, and more severe weather patterns.

SOLUTIONS TO AIR POLLUTION

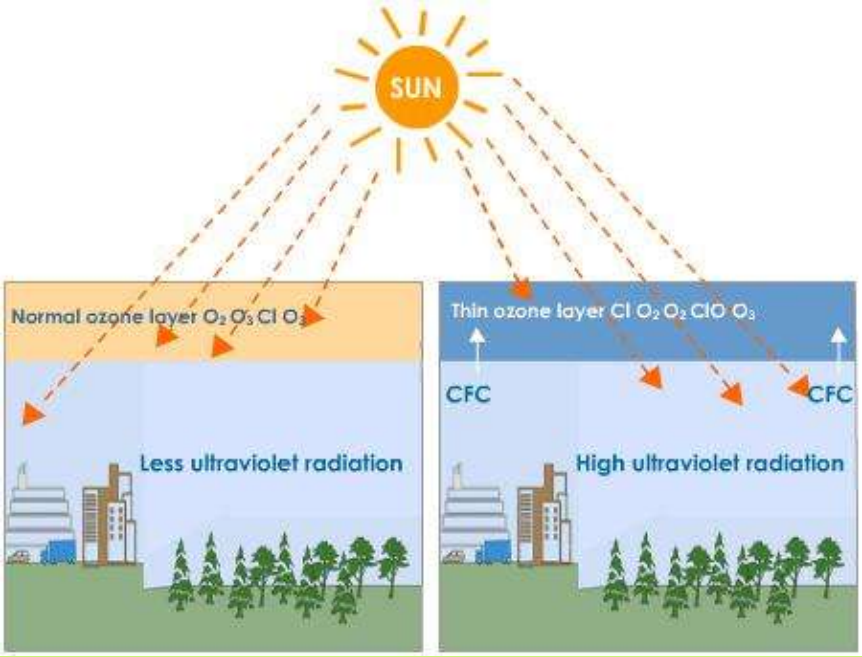
- The Clean Air Act was created in 1970.
- The US has reduced its production of air pollutants including CFCs and particulates.
- Factories have reduced the amount of sulfur dioxide and particulates released.
- High-mileage cars are common today.
- Alternative energy sources are replacing fossil fuels.

SOLUTIONS TO AIR POLLUTION

- Carmakers are producing more fuel efficient vehicles
- Trees are being planted in deforested areas
- Industries are cleaning their emissions
- Farmers are using less nitrogen fertilizer

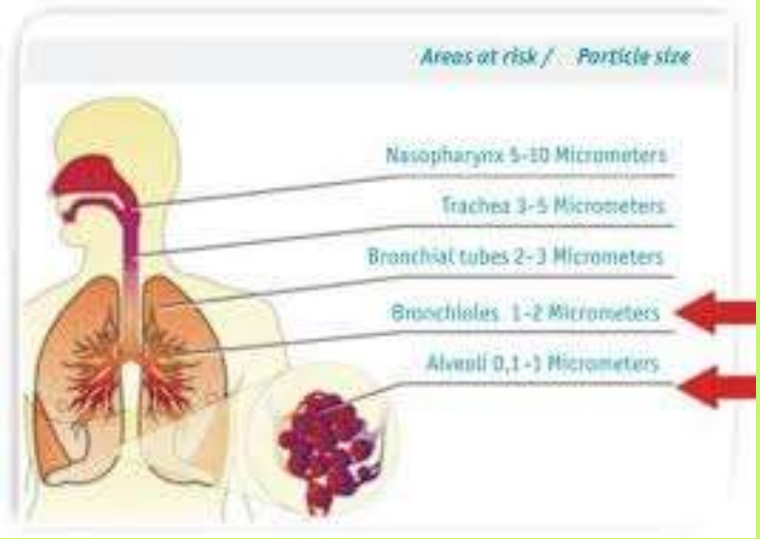
CHLOROFOUOROCARBON AIR POLLUTION

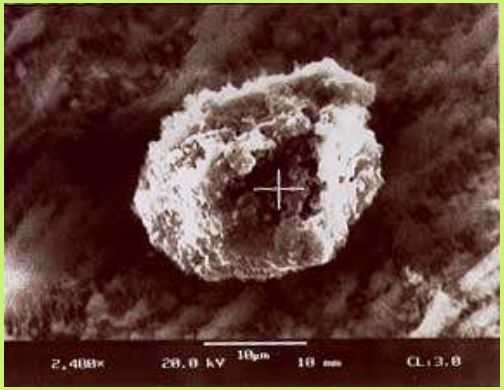
- Chlorofluorocarbons (CFCs) are pollutants that destroy the ozone layer, allowing too much UV radiation through to the earth's surface.
  - CFCs were used as refrigerants until 1966 (freon).
  - It takes 20 years for CFCs to reach the stratosphere so ozone destruction caused by this pollutant will continue for many years.



PARTICULATE AIR POLLUTION

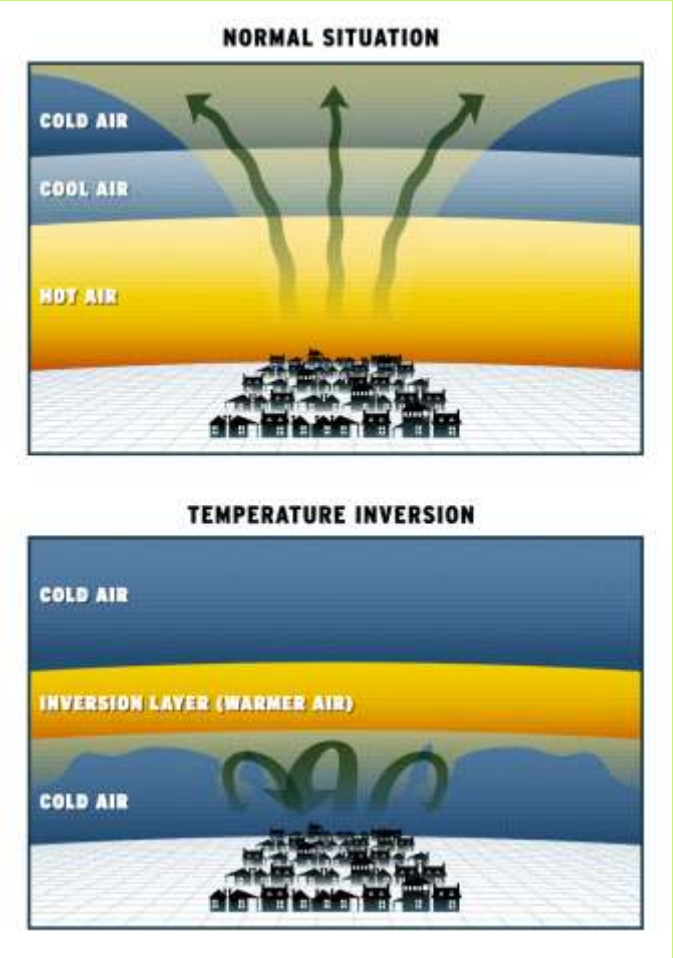
- Black smoke from **fireplace** or from a car's exhaust is incompletely burned fossil fuel which contains "particulates".
- Inhaled particulates harm people by causing asthma and other respiratory diseases.
- Particulates interact with sulfur dioxide in the atmosphere.





"SMOG"

- Smog (from "smoke" and "fog") is a dangerous form of particulate pollution common in Utah.
- Utah's wintertime inversions trap smog in our valleys.
- Smog is a major cause of respiratory illness and death.

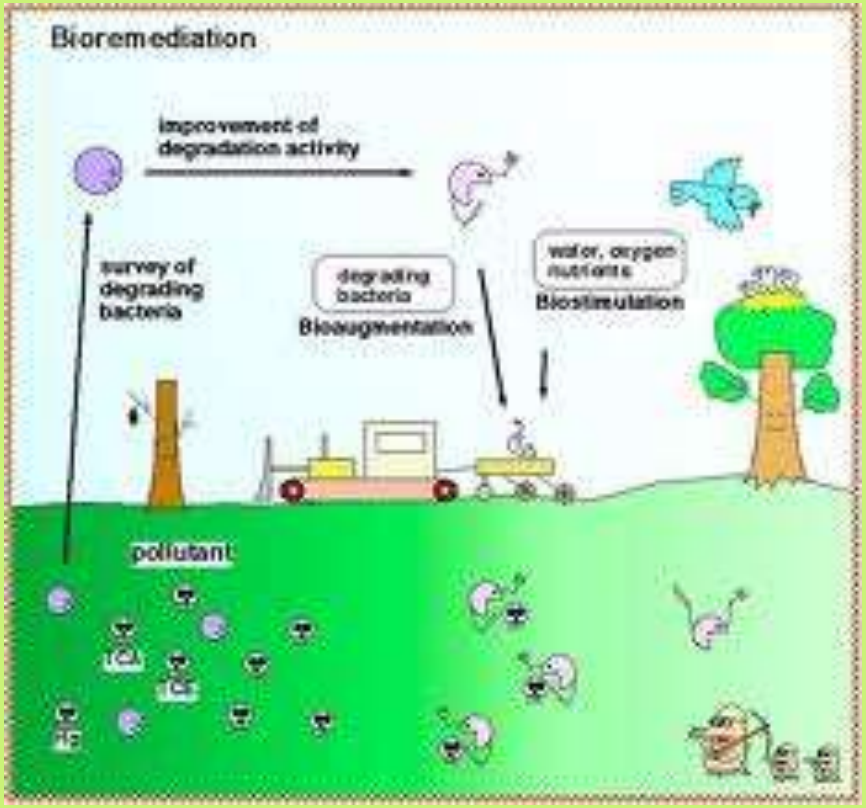


3.D. LAND POLLUTION EXPERIMENT

- Effects of an oil spill on land—
  - Vegetation
  - Soil
  - Animal life
  - Water
  - Air
  - other

3.D. LAND POLLUTION EXPERIMENT

- Bioremediation is various methods to increase the population of oil-eating microbes.
  - Microbes “eat” the oil
  - Works both above and underground



3.D. LAND POLLUTION EXPERIMENT

- Household oil/gasoline spill
  - Protect yourself !
  - Stop the spill
  - Absorb the spill
  - Collect the spill
  - Dispose properly

*notify the fire department if the spill is large or enters the storm sewer