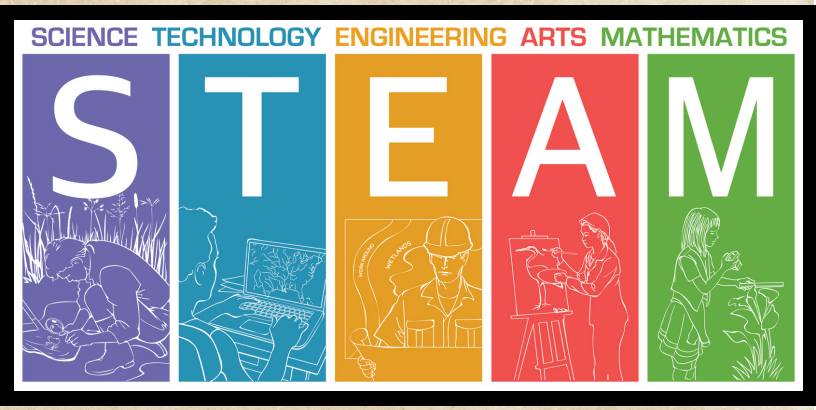
Wonders of Wetlands



Field Activity Guide

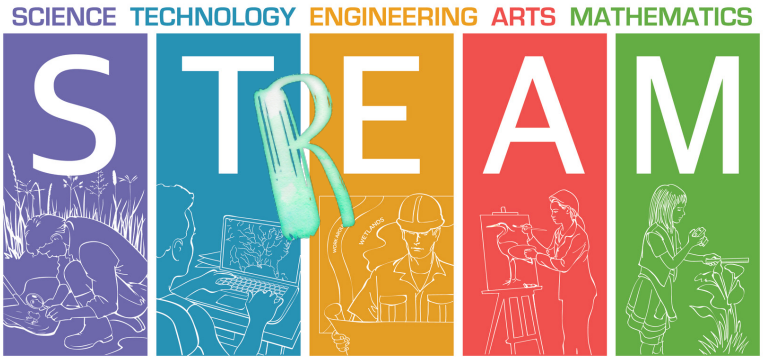
Table of Contents

Welcome

The activities in this field guide are designed to teach you about wetlands in the wild & the wonderful state of Arizona. As you explore local ponds, stream sides, springs, and pools you will gain knowledge about:

1. Wetland functions and their benefits to waterways and our planet.
2. Interconnections of wetland food webs.
3. Identification of insects, plants, and wildlife commonly found in wetland ecosystems.
4. Locations of wild and wonderful wetlands to explore.

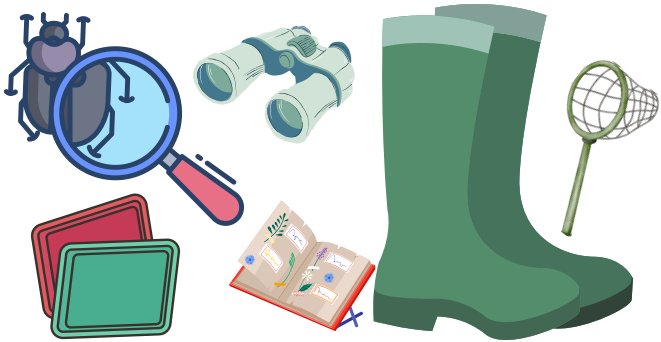
Bring this guide and visit a wetland near you!



Equipment

When planning a wetland hike, think about bringing:

1. Rain boots for muddy or wet conditions.
2. Long pants and long-sleeve shirt to protect you from bugs, plants, and the weather.
3. Binoculars to watch animals from a safe distance.



4. Nature and wildlife guide books help you identify plants and animals.
5. Net and tray for pond dipping and investigating aquatic life.
6. Backpack or knapsack to keep your materials close by.

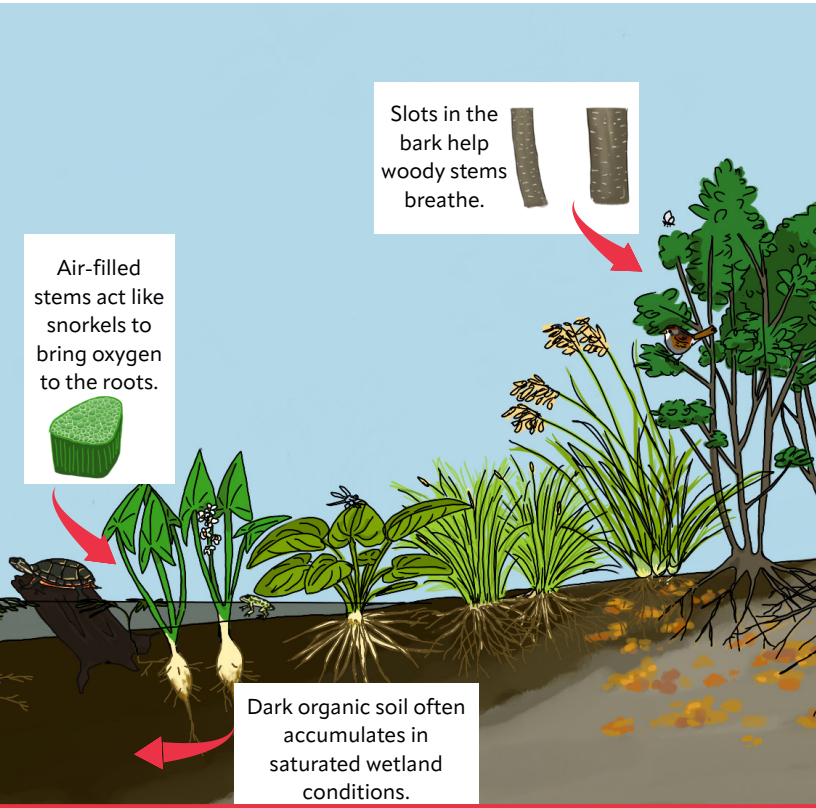
Have fun exploring the wetland and remember to be gentle with nature.

Introducing Wetlands

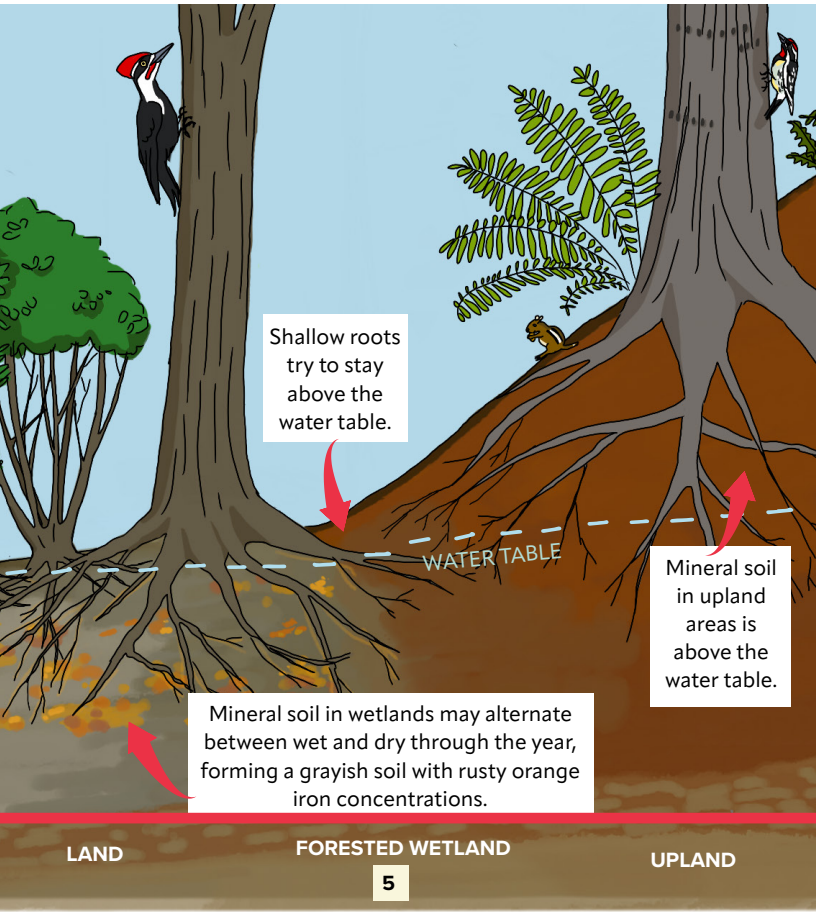
What is a wetland?

A land area that is flooded or saturated with water for at least part of the growing season, resulting in wetland soils and specially adapted wetland plants. Common wetland habitats in Arizona are riverine wetlands, isolated playa basins, glacially formed kettle lakes, emergent marshes, wet meadows, vernal pools, ciénegas, herbaceous wetlands, and wooded wetlands.

Defining a Wild and Wonderful Wetland



In Arizona, wetlands have water at or near the soil surface for two weeks or longer during the growing season. **Plants** have special adaptations to survive in the wet environment (hydrophytic plants) and **soils** develop characteristic wetland features (hydric soils).



What are three characteristics that define an area as a wetland?

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

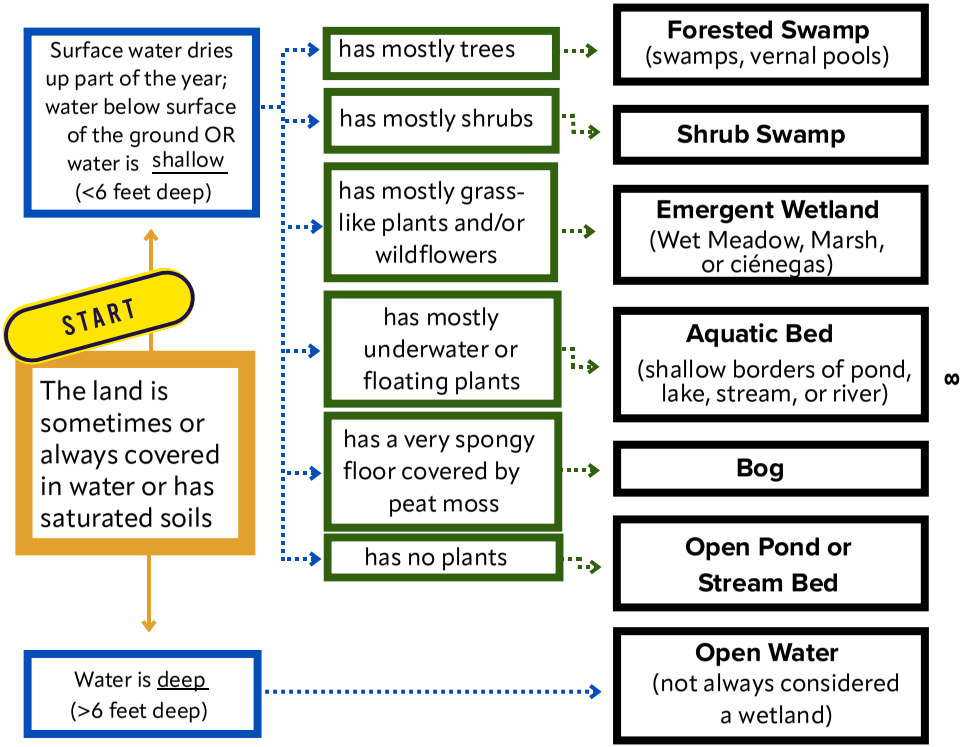
Hint: Check out the graphics on the previous pages if you need help!

Wetland Habitats

In Arizona, we have several different types of freshwater wetlands. These wetlands vary depending on the amount of water, type of soils, and the plants that grow within them.

Follow the key on the next page to classify the wetland habitat you are visiting.

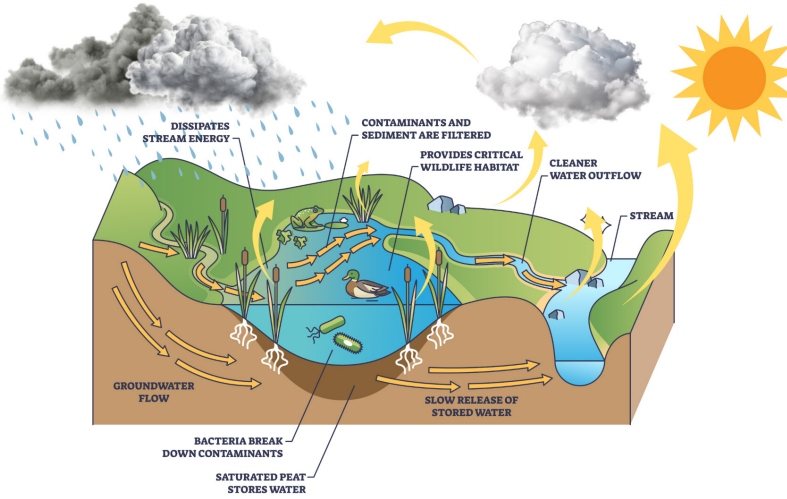
Classify your Wetland Habitat



The Water Cycle & Wetlands

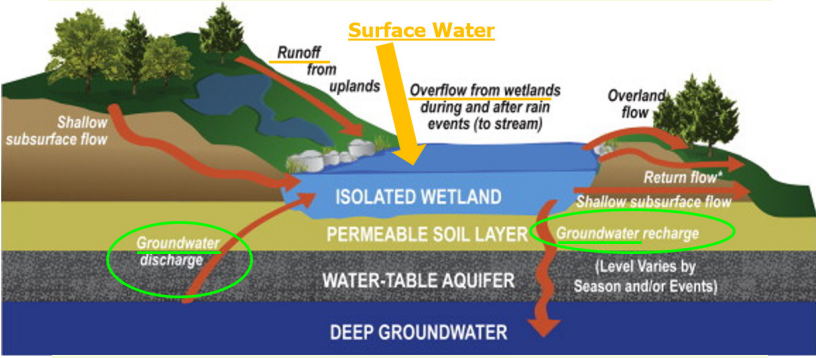
Drought or deluge, rainfall in Arizona tends to be EXTREME.

During the dry months, wetlands are some of the few places where water is still available for wildlife. This makes them very important for migrating birds and a breeding place for many animals and plants. In the monsoon season, wetlands help soak up and store storm water and which reduces flooding. Wetlands also filter and trap contaminants and can purify polluted runoff before it reaches our rivers, streams and groundwater systems.

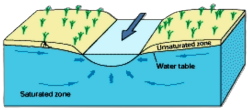


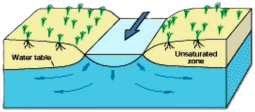
Groundwater & Wetlands

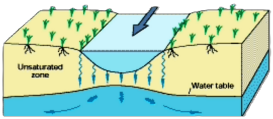
Both surface water and groundwater can contribute and effect a wetland system, especially marshes. Rain and surface runoff, fills wetlands from the top, while groundwater can fill them from the bottom (groundwater discharge).



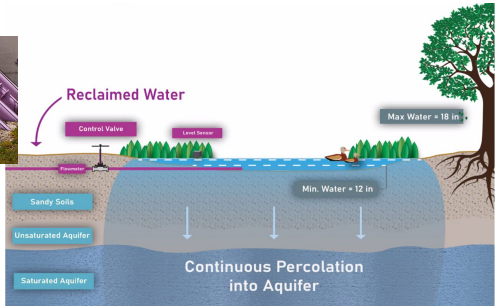
When we continuously take from the system without replenishing it, we end up with groundwater overdraft, causing the water table to drop, which can dry up our wetland systems.



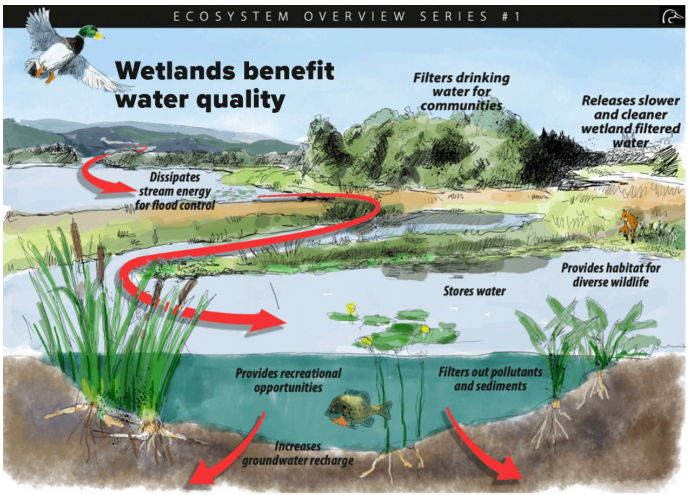




Urban Wetlands

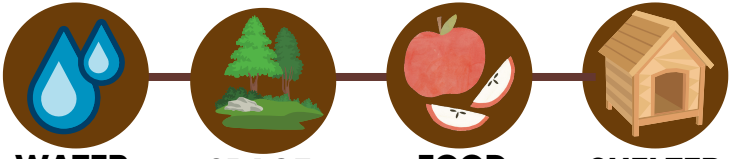


Some cities and towns use reclaimed water to create urban wetlands, creating beautiful bio-diverse habitats while also recharging our groundwater.



Wetland Ecology

Wetlands provide habitat to many different plants and animals, including many species of birds, amphibians, reptiles, mammals, and insects. The more diverse a habitat is, the more species of wildlife it can support. Wetlands offer four basic requirements that all living things need for survival:



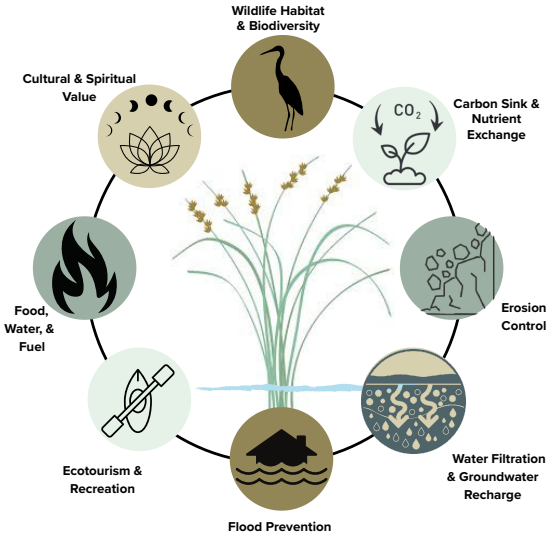
Survey the habitat around you. Which animals may have their needs met by this wetland? (List below)

Ecosystem Goods and Services

Wetlands offer many ecosystem services.

Ecosystem goods and services produce the many life-sustaining benefits we receive from nature–clean air and water, fertile soil for crop production, pollination, and flood control. These ecosystem services are important to environmental and human health and well-being, yet they are limited and often taken for granted.

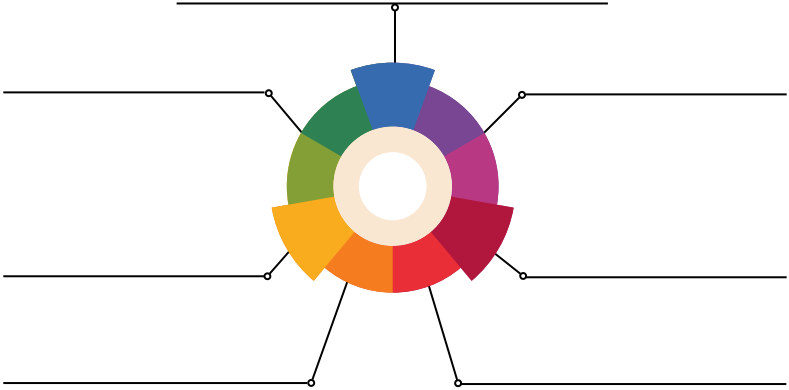
- US EPA



Wetlands are referred to as "Earth's kidneys." This is because they act as sponges absorbing and filtering pollutants from water before it goes into rivers and oceans.

Colorful Wetlands

Through their biodiversity and water features, wetlands exhibit complex color arrangements. Label the wheel with the colorful things you find in the wetland habitat.



Wetlands are so full of life that it is easy to overlook things. Careful observation can lead to new discoveries! In the box sketch something small that caught your eye.

Plant Observations

Field guides are a reliable tool to use when identifying plants. Botanists observe the arrangement, size, color, shape, and other features of leaves, as well as the location and flowers for identification. Compare the leaves and flowers of two common wetland plants or use the pictures below.
Can you note four **differences**?

1. _____
2. _____
3. _____
4. _____

Wetland Phenology

Plants do not always look the same; their looks may change with the season. The study of these biological changes that occur in relation to the season is called **phenology.** Phenology is "nature's calendar" and it impacts all living things. Common Buttonbush is shown in each of the four seasons below.

Based on your knowledge of the **seasons**, label the Buttonbush photos below: fall, winter, spring, summer.

Plant Survey

Scientists use vegetation plots to survey and record plants and their density in a specific area. To conduct your own plant survey, estimate a 1-by-1 meter area. Refer to a field guide for common wetland plants in Arizona. Record your findings in the table below.

How many plants can you ID using a supplemental field guide?

Date: _____

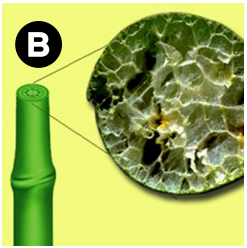
Surveyors: _____

Plant Name	% Cover

Example % covers:

Plant Adaptations

Wetland plants are known as hydrophytic and need special adaptations to survive underwater or in saturated soils. Just like us, they need to breathe air, and they have developed interesting ways to keep their leaves and roots oxygenated. Can you match the following plant adaptation photos to their descriptions?

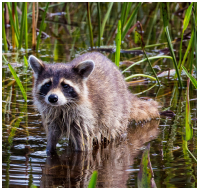


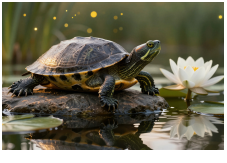
- [ ] Buttressed roots that spread wide to stabilize the plant in wet soils.
- [ ] Floating leaves stay above the water where they can breathe.
- [ ] Air-filled tissue in its stems (aerenchyma tissue).
- [ ] Multi-stemmed shrubs have lots of surface area to breathe.

Animal Adaptations

Wetland animals possess specialized adaptations to thrive in waterlogged, low-oxygen, and fluctuating environments. Use the words below to label each picture with the matching (letter) adaptation. Some may have more than one answer.

A long legs/long beak, **B** webbed feet, **C** camouflage, **D** rapid life cycle, **E** streamlined body, **F** powerful tails, **G** specialized breathing abilities, **H** lobbed toes for mud





Bird Survey

Ornithologists conduct bird surveys to understand the importance of different habitats. Wetlands are important resting, foraging, and mating habitats for many birds. Some common wetland birds are listed below.
Scan the QR code to download the Merlin ID App to learn more about each bird. Conduct a 15-minute bird survey for this wetland habitat based upon what you hear and see.

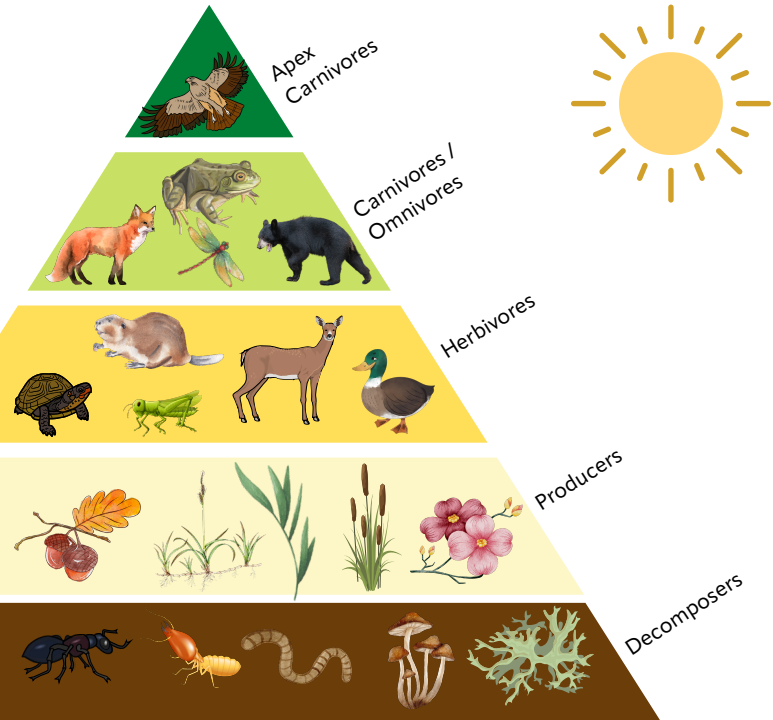
- Red-winged Blackbird
- Violet-green Swallow
- Canada Goose
- Lesser Goldfinch
- Western Bluebird
- Barn Swallow
- Pine Siskin
- Green-winged Teal
- Northern Shoveler
- American Coot

Date & Time: _____ Weather: _____

Species Name	**Observed** (seen or heard)	**Count**	**Behavior** (mating, foraging, etc.)

Wetland Energy Pyramid

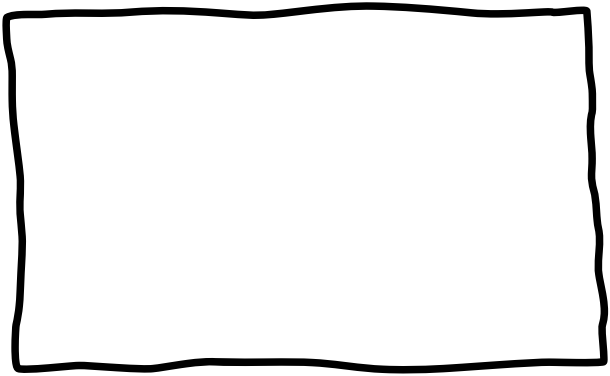
Plants, tiny organisms, and detritus make up the base of productivity in a wetland. Populations of larvae, protozoa, bacteria, and fungi feed off detritus. They are, in turn, the food for fish, worms, birds, and other consumers in the energy pyramid. Review the pyramid below and think about which animals eat what, and who eats them.



Wetland Observation

Animal identification is interesting, but understanding how each creature plays a role in their environment is equally fascinating. Observe any animal in your wetland habitat. Answer the questions below to reveal how it interacts with the wetland habitat.

IDENTIFICATION: Sketch or describe the animal in the box.



ANIMAL?

WHAT MIGHT IT EAT?

WHAT EATS IT?

OTHER OBSERVATIONS:

Wetland Clues

In the field, firsthand observations are a critical step in biological research and assessment. Tracks are some of the most obvious clues of an animal's presence. Each animal has a unique track distinguished by its number of toes, claws, or hooves, its size, and the pattern of its steps. Other clues, such as pathways, tunnels, nests, and scat are important indicators that animals are present.

Can you identify the animals from the clues below?

_____ feather

_____ scat

_____chewed tree

In the box, draw a clue that you've found! Does it indicate a specific animal? Describe it below.

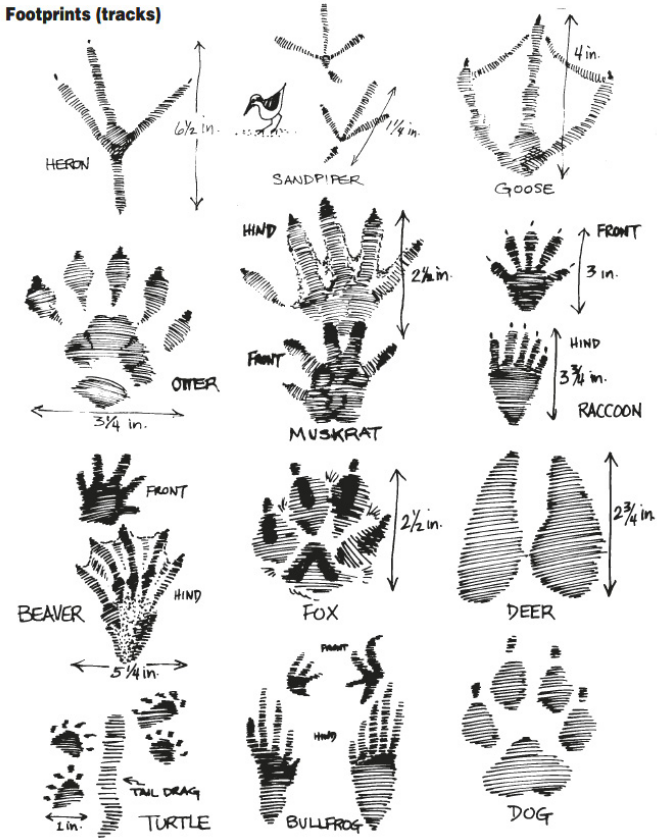
_____

_____

_____

Wetland Tracks

Circle any tracks that you can identify in the wetland you are visiting.



Wetland Biodiversity

The Grand Canyon State is home to 1 salamander species, 60 snake species, 26 frog and toad species, 10 turtle species, and 50 lizard species. Frogs and toads are collectively known as anurans, meaning a tailless amphibian. Herpetologists estimate anuran populations and diversity by recording which animals they hear calling in an anuran survey.

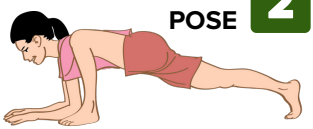
A Colorado River Toad

Amphibian and Reptile Yoga

Try your favorite yoga pose. Can you hold all four?

1 SNAKE POSE

LIZARD POSE **2**



3 FROG POSE

TURTLE POSE **4**

Make a paper jumping frog with origami!
Scan the QR code for instructions.

Anuran Species found in Arizona

Below is a list of some frogs and toads located in Arizona. As you venture through various regions in the state, be sure to keep an eye (and ear) out for the possibility of discovering even more fascinating species!

- [ ] Arizona Toad: streams & uplands
- [ ] Arizona Treefrog: green/brown forests
- [ ] Great Basin Spadefoot: Great Basin
- [ ] Sonoran Desert Toad: Sonoran Desert
- [ ] Baja California Frog: Baja California
- [ ] American Bullfrog: widespread (introduced/invasive)
- [ ] Colorado River Toad: Colorado River
- [ ] Red-spotted Toad: deserts
- [ ] Great Plains Toad: Great Plains
- [ ] https://awcs.azgfd.com/species/amphibians
- [ ] https://reptilesofaz.org/amphibians/

Each species of frog or toad has a unique call. They call for several reasons, but primarily to attract a mate and to defend territory. They might croak, bark, hum, or even squeak.

Which frog calls can you hear?

Anuran Survey

Anuran surveys should be conducted from early spring to early summer when the air is damp or with a light rain.
To conduct a frog and toad survey, follow these steps:
(1) select a monitoring site
(2) listen for 3 minutes
(3) record the types of vocalizations you hear

ANURAN CALL INDEX DEFINITIONS

1 Individual (I) calls can be counted if there is space between calls.

2. Some calls are **overlapping (O)**, but individuals are still distinguishable.

3. Chorus (C) is continuous/overlapping so it's impossible to count individuals.

4. Observed (OB)indicates a species was observed, but not heard during the survey.

Date & Time: _____ Air Temperature: _____

Weather: _____ Wetland Habitat: _____

Anuran Species	Call Index	What does the call sound like?

Wetland Macroinvertebrates

A **macroinvertebrate** is an animal without a backbone that is large enough to be observed without a microscope or magnifying glass. They spend all or part of their lives in water. These aquatic organisms tend to be more sensitive to environmental changes, such as temperature, pH, and/or dissolved oxygen level.

Dragonfly larva attached to vegetation.

Ebony jewelwing resting on pondweed.

Humans often play a role in habitat change. For example, if an herbicide is sprayed on the edge of a wetland, the chemical will spread quickly through the water. This may result in killing off pond vegetation, decreasing hiding spots for young aquatic organisms and increasing sunlight exposure raising water temperature.

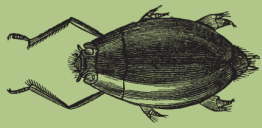
Review the definitions on the next page to learn more about water chemistry.

Macroinvertebrate Identification

Scud / Sideswimmer

seven pairs of legs, the first two are claw-like, swims with a sideways motion

Whirligig Beetle



three-pairs of legs, front two legs are much longer than the rest

Mayfly Larva

three-pairs of legs with a single hook at the end, 2-3 tail filaments, gills attached to the abdomen

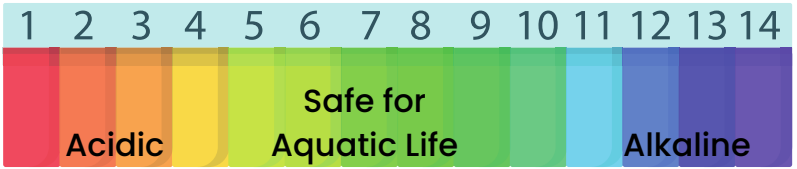
Dragonfly Nymph

three-pairs of legs, large eyes, long spoon-like jaws, no tail on abdomen

How many can you locate?

Water Chemistry

pH is a measure of acidity or alkalinity of a solution.
A neutral pH is a 7 on the pH scale, with most aquatic life preferring a pH range of 5.5-8.5.
Wetlands provide a natural buffer to neutralize acids (acidic) and bases (alkaline) in a solution.



Dissolved Oxygen (DO)
DO is a measure of how much oxygen is dissolved in a solution. Both plants and animals need oxygen to survive. If the levels are too low, it can stress the aquatic life. DO can be affected by weather (wind, rain, etc.) and temperature (cold water holds more oxygen than warm). On a scale of 1-10 parts per million (ppm), 5.5 or higher is ideal for aquatic life.

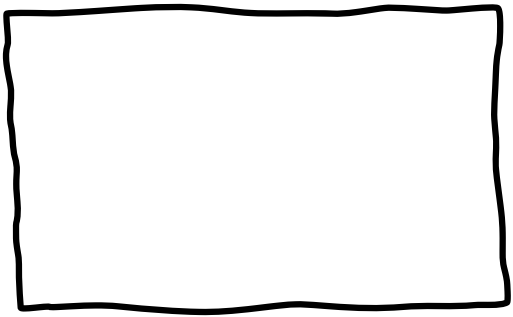
Temperature is an important measurement of how hot or cold a solution is. Many creatures that live in water are cold-blooded, so their body temperatures, metabolisms, and growth rates are determined (and limited) by the surrounding water temperature.

Macroinvertebrate Survey

Date & Time: _____ Weather: _____

Average pH: _____ DO: _____ Average Water Temp: _____

Draw a sketch of the area you're sampling, include important features such as trees, vegetation, paths, etc.



Type of wetland habitat:

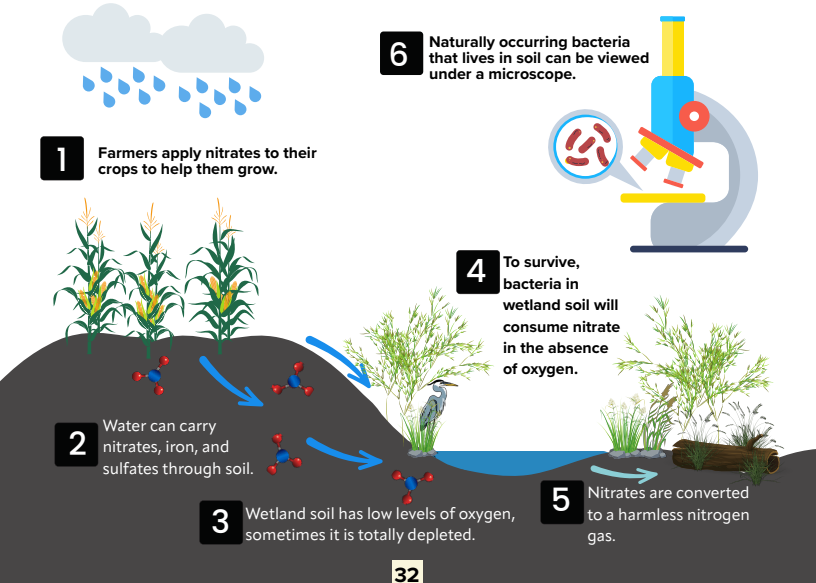
_____

Collect a macroinvertebrate sample by submerging a net, disturbing the bottom substrate, and then sweeping it through the water for a distance of one meter. Place the animals in a pan of water to record your observations.

Common Wetland Macroinvertebrates	Count	Notes
Crayfish		
Mayfly Larva		
Caddisfly Larva		
Dragonfly Nymph		
Damselfly Nymph		
Scud (sideswimmer)		
Whirligig Beetle		
Leeches/Worms		
Pouch Snails		

Microscopic Interactions

One of the smallest forms of life on our planet is bacteria. Some bacteria use oxygen in the same way animals do: they combine it with organic matter and turn it into carbon dioxide, water, and energy. Bacteria have adapted to live in a wetland setting, just like plants. In low oxygen environments, like wetland soils, bacteria use nitrates, iron, sulfates, and other chemicals instead of oxygen to transfer energy from organic matter. Removing these chemicals from the water is one of the ways wetlands purify water.



Soil Survey

Scientists are often consulted to evaluate and interpret soil samples. Review the chart on the next page. Soil data can tell us important information, such as whether the area qualifies as a wetland or how much carbon is stored underground. Try your hand at identifying soil textures by digging down 4 inches and working through the chart on the next page.

Record your observations below for **two** soil samples.

Date & Time: _____

Location of soil sample: _____

Does the soil have an odor? If so, describe it: _____

What color(s) do you see in the soil? _____

Is there organic material in the top layer? _____

What is the texture of the soil? _____

Date & Time: _____

Location of soil sample: _____

Does the soil have an odor? If so, describe it: _____

What color(s) do you see in the soil? _____

Is there organic material in the top layer? _____

What is the texture of the soil? _____

Mineral Soil Texture Survey

START

Place approximately 2 tsp. of soil in your palm. Add water by drops and knead the soil until it is moldable and feels like moist putty.

Add dry soil to soak up water.

Add drops to make soil more wet.

Does soil remain a ball when squeezed?
YES NO

Is soil too dry?
YES NO

Is soil too wet?
YES NO

SAND

Place ball of soil between thumb and forefinger. Gently push the soil with thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width (1/8 inch). Allow the ribbon to emerge and extend over forefinger until it breaks from its own weight. Does soil form a ribbon?
NO YES

LOAMY SAND

Does the soil make a **weak** ribbon less than 1 inch long before breaking?
YES

Does the soil make a **medium** ribbon 1 to 2 inches long before breaking?
YES

Does the soil make a **strong** ribbon 2 inches or longer before breaking?
YES

Wet a small pinch of soil in palm until it is very wet. Rub soil around with your finger.

SANDY LOAM

Does soil feel very gritty?
YES NO

Does the soil feel very smooth?
YES NO

Neither grittiness nor smoothness predominates.
YES

LOAM

SANDY CLAY LOAM

Does soil feel very gritty?
YES NO

Does the soil feel very smooth?
YES NO

Neither grittiness nor smoothness predominates.
YES

CLAY LOAM

SANDY CLAY

Does soil feel very gritty?
YES NO

Does the soil feel very smooth?
YES NO

Neither grittiness nor smoothness predominates.
YES

CLAY

SILTY LOAM

SILTY CLAY LOAM

SILTY CLAY

Impacts to System

Species Highlight

Bebb's Willow

Drought

The drying of wetlands can lead to local extinctions and reduced species distributions. Drought reduces water availability, causing habitat loss and increased stress on dependent species.

Key environmental challenges include:

- Habitat shifting
  (changes in habitat composition and location)
- Droughts (reduced rainfall)
- Temperature extremes
  (deviations from typical ranges)
- Storms and flooding
  (high precipitation, high winds, altered storm timings)

Native vs. Invasive

The **Great Plains Toad**, native to Arizona, has smooth olive-hued skin and measures 2 to 3 inches in length. It is typically found near water sources like ponds, marshes, streams, and has adapted to agricultural areas.

Great Plains Toad

Invasive Russian Thisle

Aquatic invasive plants like Giant Reed can overtake wetlands, and riparian invasive plants such as **Russian Thistle** disrupt flow patterns. Both decrease habitat diversity and alter food availability for native species.

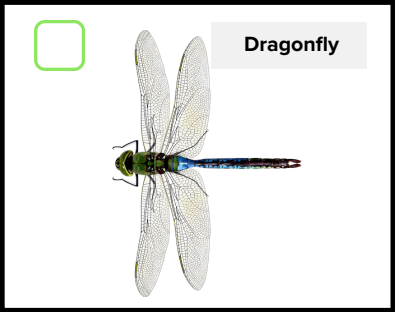
Springo!


Cattail


Seed pod

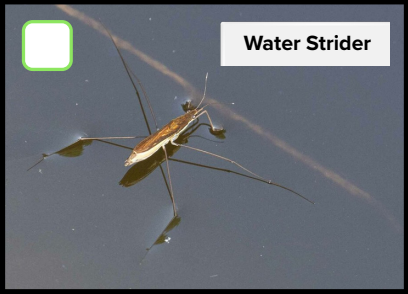

Waterfowl

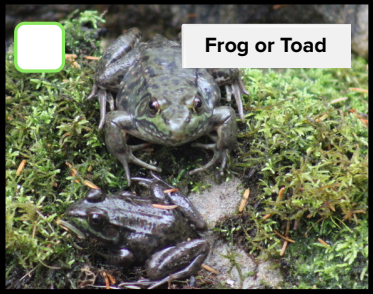

Multi-stemmed shrub

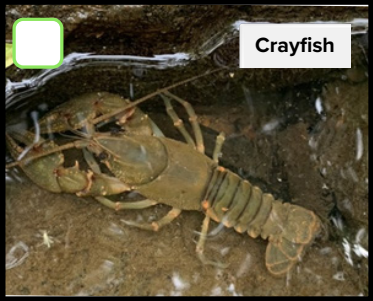

Dragonfly


Grass

Look for things that live and grow in this habitat. As you spot photos in the table, shout "SPRINGO"! How many can you find?

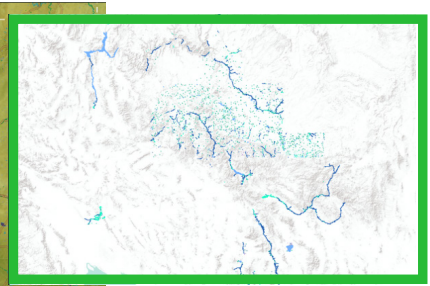






Wetland Locations

Visit the Wetland Mapper by USGS or the US Fish and Wildlife Service. There is no shortage of wetlands to explore in our Grand Canyon State.
Click the link below for the interactive map!



Visit the wetland near you or check out all!

Leave No Trace

Be a Responsible Wetland Steward

- Make sure to leave with everything that you brought with you. Remove and correctly dispose of your trash.
- Leave rocks, plants, and other natural objects as you find them. Do not build structures, engrave marks on trees, or change the surroundings. Take only pictures and leave only footprints.
- Always be respectful of wildlife, giving them space and don't disrupt what they are doing. Be extra careful around breeding time and when young are present. Observe from a distance and never feed the animals.
- Be considerate of other visitors and kindly share the space.

Enjoy your time in nature!

ARIZONA project WET
WATER EDUCATION TODAY